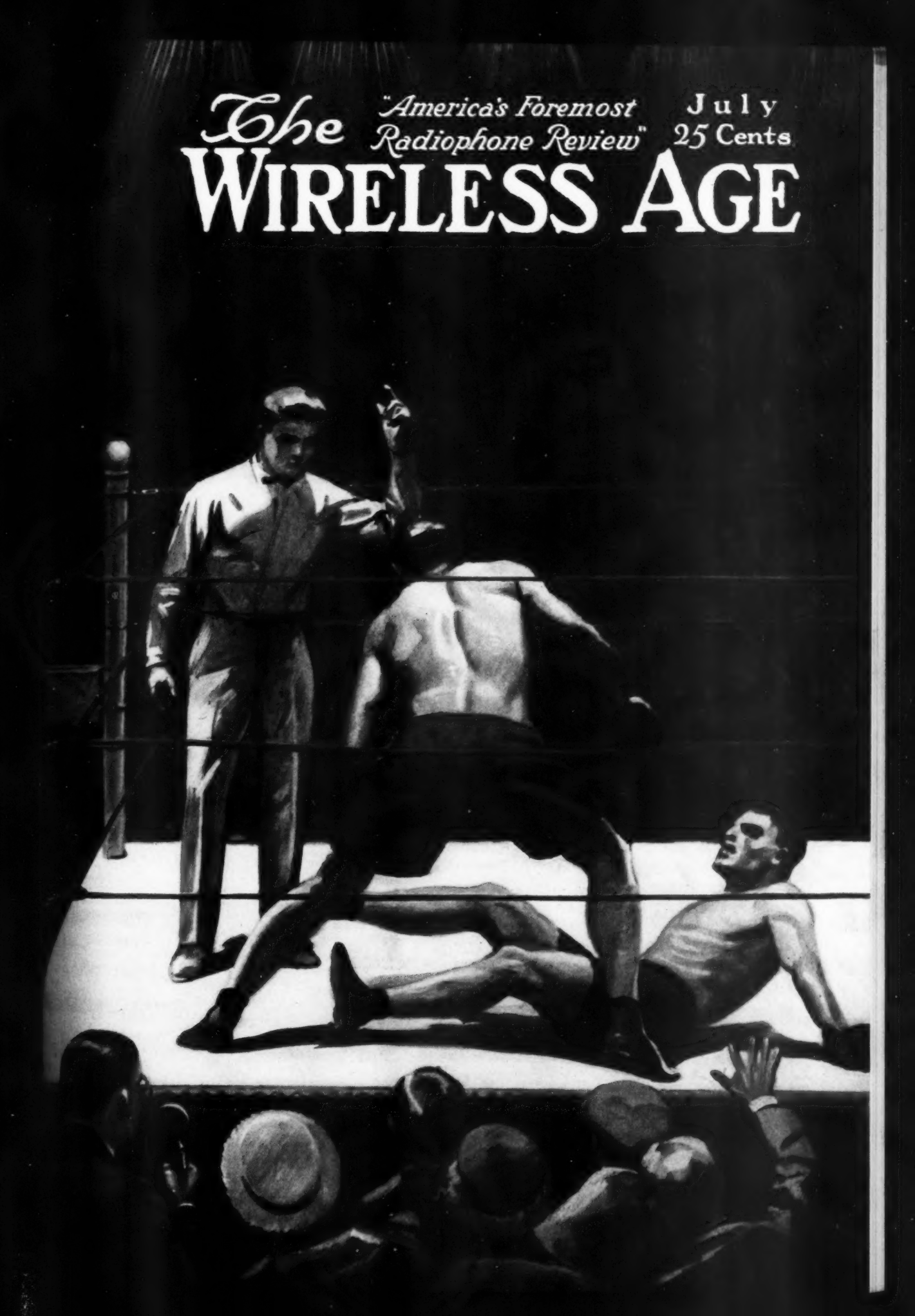
"America's Foremost Radiophone Review"

July
25 Cents

The WIRELESS AGE



Filament Current .06 amp.
Mutual Conductance 337
Micromhos at 40 volts plate
and 0 grid potential.

Cut shows actual size of tube
3 inches high

Type C-299
Price $6.50

Announcing the New

Cunningham

Dry Battery Detector and Amplifier Tube

Designed by the engineers of the General Electric Company's great research laboratories, this new dry battery tube, type C-299, is by far the most economical vacuum tube ever placed on the market for amateur, experimental and entertainment use.

It has been designed for use as a Detector and Amplifier of both radio and audio-frequency currents. The filament is lighted from three 1½ volt dry batteries in series, and the filament current is only .06 of an Amp. This is less than one fourth of the current of any previous type of dry battery tube. This feature makes it possible to use four of these tubes in parallel, with only one set of three dry batteries.

The C-299 has practically the same operating characteristics as the previous Cunningham Amplifier, type C-301. Due to the low distributive capacity of the elements it is an excellent radio-frequency amplifier. When used as an audio-frequency amplifier the output from two steps is sufficient for the operation of a small loud speaker.

Bulletin No. 2-W describes this new tube in full and gives the necessary data regarding rheostats, battery voltages, transformers, etc. A free copy will be sent to you by return mail, upon receipt of your request at either of the addresses given below. Complete instruction sheet for its care and operation is packed with each of these New Cunningham Dry Battery Tubes, type C-299.

248 First Street
San Francisco, Calif.

C. J. Cunningham

154 W. Lake Street
Chicago, Illinois

Get Long Range *with RCA radio-frequency transformers*

Model UV-1714
$6.50

Model UV-1716
$8.50

—To make a small inside loop reach as far as an outside antenna.

—To increase tremendously the range of an outdoor aerial without distortion.

To amplify singly or in cascade; complete shielding prevents interaction of fields.

—To cover a broad band of wave lengths and pick up stations of every class.

Particularly Adapted for Use with RCA Radiotron Tubes

Insist on RCA audio and radio-frequency transformers at your dealer.

RCA

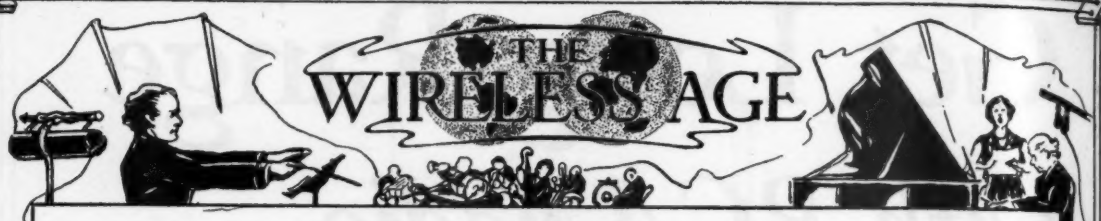
This symbol of quality is your protection.

Radio WORLD WIDE WIRELESS Corporation of America

Sales Dept. Suite 2064
233 Broadway
New York

District Sales Offices
10 So. LaSalle Street
Chicago, Illinois

433 California Street
San Francisco, California



Volume 10 *Edited by* J. ANDREW WHITE *Number* 10

July, 1923—Contents

Cover Design, *By Chas. F. Jaeger*
Editorials - - - - - - - - - 17
Pictorial Section - - - - - - 18
Three Knock-Outs Give Thrills to Radio Fans 22
Concert Managers Say "Yes," Also "No," *By Ward Seeley* - - - - - 28
Marion Armstrong, *Interviewed by R. M. Clarke* - - 35
Dr. Russell H. Conwell, *Interviewed by W. E. Johnson* - - - 36
Josephine Vellanti, *Interviewed by Edwin Hall* 37
Station KFDB, San Francisco, California, *By Erald A. Schivo* - - - - - 38
Patricia Boyle, *Interviewed by Sam Loomis* 39
Radio Broadcast Central - - - - - 40
Mrs. Cutting, *Interviewed by Marie de Fleury* 42
"Pay If You Profit," Say Copyright Owners, *By E. C. Mills* - - - - - - 43
Distant Broadcasting Stations Heard - - 46
Humor - - - - - - - - - 47
Cartoons - - - - - - - - - 48
Broadcasting Directory - - - - - 49
World Wide Wireless - - - - - 51
Radio on the Riviera - - - - - - 53
"This Is the Life," *By Edward T. Jones, I.R.E.* - - - 54
The Station of Greenhorn's Fate, *By Ortherus Gordon* - - - - - 55
Four Loops and a Nation-Wide Radio Service 57
Basic Principles in Receiver Design - - 58
Converting Sound Into Electricity, *By Bernard Steinmetz* - - - - 59
An Efficient Crystal Broadcast Receiver, *By Guy M. Chase* - - - - - 60
Installing Radio Laboratory on a Mastless Ship - - - - - - - - - 61
A Complete Portable Tube Receiver, *By Carl Dreher* - - - - - - 62
Directive Telegraphy, *By Jerome Snyder* - 63
Satisfactory Use of A. C. on Receiving Tube Filaments - - - - - - - - 65
Midget Receiver With Aerial Fits in Vest Pocket, *By Raymond Francis Yates* - 66
Transmitting Photographs by Radio, *By Otto Wilson* - - - - - - 67
Burying the Antenna in a Well, *By S. R. Winters* - - - - - - 69
A Novel Indoor Antenna, *By Max Abel* - 69
Auto-Coupled Reception Circuits, *By S. Hamilton* - - - - - - - 70
A Portable Receiver, Using Flashlight Filament Batteries - - - - - - 71
How I Rolled My Own, *By W. M. Mace* - 71
New Appliances and Devices - - - 72
Industrial Inklings - - - - - - 74
International Notes, *By Charles Bailly, Paris* 76
NAWA - - - - - - - - - 77
Queries Answered - - - - - - 79
Stations Worked and Heard - - - 81
Book Reviews - - - - - - - 81
Advertisers' Index - - - - - - 94
Amateur Radio Stations of the United States 95

PUBLISHED MONTHLY AT WIRELESS PRESS, INC., 326 BROADWAY, NEW YORK
GREAT BRITAIN, 12-13 Henrietta St., London. AUSTRALIA, 97 Clarence St., Sydney, N. S. W.

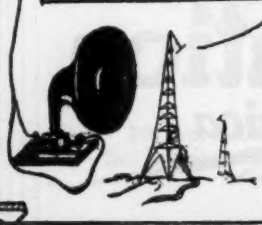
CHICAGO, ILL., Marquette Bdg. Wheeler & Northrup
LOS ANGELES, CALIF., 456 So. Spring St. Coast Publishers Co.

Yearly subscription in U. S. A., $2.50—Outside U. S. A., $3.00; Single Copies, 25 cents. Entered as second class matter Oct. 9, 1913, Post Office, New York, N. Y., under the Act of March 3, 1879. Copyright, 1923, Wireless Press, Inc. When subscription expires you will find a renewal blank enclosed. Return with remittance promptly. Notify us of any change in your address, giving both the old and new location.

James G. Harbord, Pres. J. Andrew White, Vice Pres. L. MacConnach, Secy. George S. DeSousa, Treas. J. O. Smith, Business Mgr.

Because certain statements and expressions of opinion from correspondents and others appearing in these columns from time to time may be found to be the subject of controversy in scientific circles and in the courts, either now or in the future and to sometimes involve questions of priority of invention and the comparative merits of apparatus employed in wireless signalling, the owners and publishers of this magazine positively and emphatically disclaim any privity or responsibility for any statements of opinion or partisan expressions if such should at any time appear herein.

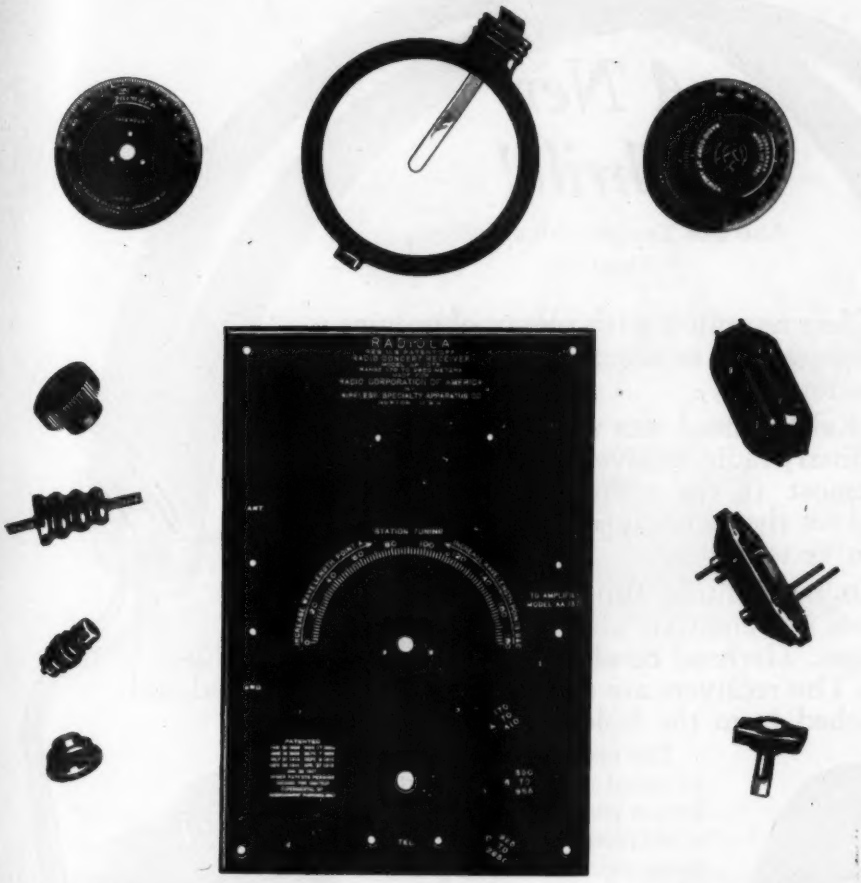
Printed in U. S. A.



"America's Foremost Radiophone Review"

THE WIRELESS AGE is a member of the Audit Bureau of Circulations. During the last six months of 1922 there were printed 204,650 copies of THE WIRELESS AGE.

This issue 57,000 copies



Standard Radio Products

of

Wireless Specialty Apparatus Co.

for

Radio Corporation of America

Moulded from

BAKELITE

Condensite

REDMANOL

"Shawlac"

by

SHAW INSULATOR COMPANY

Founded 1892

HENRY M. SHAW
President

FRANK H. SHAW
Vice-Pres. and General Mgr.

SHAW

Works and Office:

150 Coit Street
IRVINGTON-NEWARK
N. J. U. S. A.

A New Thrill!

Listen-In Tonight with a Kellogg Head Set

Clear reception with plenty of volume is necessary to satisfactorily listen to distant stations.

Kellogg head sets should not be classed as ordinary radio receivers. Today Kellogg stands foremost in the manufacture of a high-grade head set that actually surprises listeners in comparative tests.

Maximum volume, unusual clearness, extreme lightness in weight, are a few of the many outstanding advantages. The head band is unusually light, though durably built. The receivers are easily adjusted to fit the head, and can be detached from the holders when desired.

The magnets are of special tested steel and hardened by our own special method which controls the heat and time electrically and mechanically, eliminating any possible variation as when manually controlled.

The magnet windings are of great accuracy, the mountings, end plates, wire, insulation, etc. are of the highest grade and of the best material suited for the purpose.

Our twenty-five years experience in building receivers for telephone work has proven invaluable in turning out a real radio receiver of merit.

Hundreds of voluntary testimonial letters tell us of the superiority of Kellogg head sets in actual comparative tests, barring none.

Listen-in tonight with a pair of Kellogg receivers and get a new thrill from your radio set. Kellogg radio products are all in a class by themselves from a quality, service and appearance standpoint. With Kellogg radio equipment, USE Is The Test.

KELLOGG SWITCHBOARD & SUPPLY COMPANY

CHICAGO

COLUMBUS KANSAS CITY SAN FRANCISCO PORTLAND

Kellogg apparatus exclusively is used in building The Symphony Receiver

The Symphony

The ability to select your entertainment from the various programs that are being broadcast, and the clarity with which long distance stations can be heard depend entirely on the quality of the receiving set.

The Symphony is an unusually good receiver. By turning a single knob under proper conditions, it is possible to tune in stations, one by one, to the total exclusion of all others.

This improved circuit, in the vernacular of the technical expert, is an improvement over the single circuit by means of a variometer, and affords unusually selective reception.

So efficient is the Symphony that its volume, at any stage, surpasses many sets, and is equal to many other receivers using additional stages of amplification.

Every piece of apparatus that goes into the Symphony is the best that can be produced, and each unit is correctly mounted in proper relation to each other part, factors that play an important part in your satisfaction of radio.

The placing of a Symphony in your home is a permanent investment that will win your instant approval, and occupy a prominent place among your most cherished possessions.

The Symphony Receivers are made in two types—detector, and two or three stages of audio frequency amplification.

If your dealer cannot furnish information on the Symphony, wire, or write for illustrated catalog, giving us his name.

JONES RADIO COMPANY

Lytton Building, Chicago

The Symphony is manufactured under the U. S. Patent No. 1113149, Armstrong Regenerative Circuit

All parts used in the Symphony are built and guaranteed by the Kellogg Switchboard & Supply Company, manufacturers for twenty-five years of complete telephone equipment

BURGESS
RADIO BATTERIES

Are the accepted standard for radio circuits. Leading manufacturers recommend Burgess Batteries and they are specified by radio engineers. Being designed and built by radio engineers brings a guarantee of satisfactory service to you.

BURGESS "B" BATTERIES

Burgess "B" Batteries can be furnished in several types or styles and in varying capacities. Drop in to your dealer's store today. Select the Burgess "B" best fitted to the requirements of your set and invest confidently, knowing that in the judgment of thousands of users the Burgess is the one best radio battery.

BURGESS No. 6 BATTERIES

Are recommended and have proven highly satisfactory for use in "A" or filament circuits where the 1½ volt vacuum tubes are used.

BURGESS BATTERY COMPANY
Engineers-DRY BATTERIES-Manufacturers
Flashlight—Radio—Ignition—Telephone

General Sales Office: Harris Trust Bldg., Chicago
Laboratories and Works: Madison, Wisconsin

Branches:
New York Boston Washington St. Paul
Kansas City New Orleans

In Canada:
General Offices and Works: Niagara Falls, Ont.
Branches: Toronto Montreal Winnipeg St. John

BURGESS
RADIO BATTERIES
"ASK ANY RADIO ENGINEER"

Your phone plus Fibertone makes a beautiful musical instrument

A better horn at a lower price $8

A vast increase in the demand for the Fibertone has brought a decrease in the price to $8. With new scientific developments by men living in the atmosphere of perfect musical instruments, this becomes a great event in radio history. Pleasurable radio entertainment can now be had at a cost that is not a burden to the average enthusiast's pocketbook.

The true-toned performance of the Fibertone is due to its construction of fiber. No vibrative sounds can possibly mar the clearness of its amplification, as often occurs in horns of metal.

Your nearest dealer will be glad to demonstrate the Fibertone to you.

Dealers write for information.

Fiber Products Company
240-A N. 10th Street, Newark, N. J.

FIBERTONE
RADIO HORN

PERFECT FILAMENT CONTROL FOR ALL TUBES

C-300
C-301
C-301A
WD-11
WD-12
UV-200
UV-201
UV-201-A
U V-199

Ask for the Universal Bradleystat With 3 Terminals

A Perplexing Problem Solved!

TRY any tube in your radio set! It makes no difference what tube is used, the new universal Bradleystat with three terminals will give perfect filament control. A very simple change of connections and a remarkable range of control make this possible for the first time in radio history. Like former Bradleystat models, the new universal Bradleystat with three terminals is covered by the same iron-clad guarantee of perfect performance, noiseless control and quicker tuning that sold hundreds of thousands of Bradleystats during the past year.

Be prepared to try any new tube by replacing your present rheostats with the new universal Bradleystat. It is the last word in flexible and perfect control. It is backed by twenty years' experience with graphite disc rheostats. *Beware of imitations.* Avoid the use of inferior carbon powder rheostats. The name "Bradleystat" is embossed on container for your protection.

Mail the coupon below for full information about the latest and most remarkable development in filament control. CLIP THE COUPON, NOW!

ALLEN-BRADLEY CO. · 283 Greenfield Ave. · MILWAUKEE, WIS.

I am pleased to hear that the universal Bradleystat with three terminals has solved the perplexing problem of finding one rheostat for all tubes. This is good news. Please send me full information and explain how it is done.

_____

_____

_____

When writing to advertisers please mention THE WIRELESS AGE

Price, mounted only

6 to 1 ratio transformer
$4.50
(with Red Label)

3½ to 1 ratio transformer
$4.00
(with Blue Label)

The New THORDARSON

Audio Frequency Amplifying Transformer

For the past twenty-eight years THORDARSON transformers have been installed in the country's greatest engineering concerns, manufacturing plants and immense central stations. The first 1,000,000-volt transformer in the world was devised and constructed by THORDARSON engineers. The history of the improvement of transformers could be read in the history of THORDARSON development.

The new shell type audio frequency transformer is scientifically and mechanically perfect. A thorough understanding of its construction will convince you that it would be physically impossible for the transformer you are now using to obtain results equal to the THORDARSON in either amplification or tonal perfection.

SPECIFICATIONS

THORDARSON transformers are constructed and assembled entirely in the THORDARSON plant—not merely assembled as is the case of most transformers now on the market. Core is made of .007 mil highest grade silicon steel, No. 36 gauge—the cross section of which measures ¾ inch—twice that of an ordinary amplifying transformer. The coils of No. 40 wire are *square layer wound* to fit the square core—wound by machines designed and developed entirely by THORDARSON. Our new coil is a recent achievement of THORDARSON engineers. Between each layer of wire is the finest grade 1,000-volt condenser paper—the transformer is guaranteed and tested to withstand 600 volts D. C. without breakdown.

These transformers are designed to serve with tubes now on the market. For a one-stage set, use the 6 to 1; for two stages, hook up the 6 to 1 type on the first stage, and the 3½ to 1 on the second stage. These transformers, balancing exactly the resistance of the plate circuit of one tube with the grid circuit of the following tube, have proven to produce the maximum of amplifying efficiency by exhaustive tests and experiments at all audible frequencies.

Your receiving set and the pleasure you derive from it depends upon the transformer you use and it is our firm belief that this new THORDARSON Amplifier is the finest the market affords. For sale at good dealers at our new prices.

THORDARSON

ELECTRIC MANUFACTURING COMPANY

500 Huron Street Chicago

Brandes

Bring all the world to him!

HEALTHIER bodies when minds are happier. And happier minds when long hours are lightened by the wealth of news and music on the air.

But be sure to give the patient the comfort of a Brandes *Matched Tone* Radio Headset. It is unusually light, neatly finished and it is *matched in tone*. Every sound is perfectly transmitted without any of the noises which might disturb sensitive nerves.

Not only invalids, but older people whose activity is limited, revive their contact with the world by means of Radio—and a Brandes.

Send ten cents in stamps for the "Beginner's Book of Radio." It explains radio in terms that anyone can understand.

Made in Canada and England by
Canadian Brandes Limited, Toronto and London

Distributed in Canada by
Perkins Electric Limited
Toronto — MONTREAL — Winnipeg

Distributors in New Zealand and Australia
International Electric Co., Wellington, N. Z.

C. BRANDES, Inc., 237 Lafayette St., N.Y.C.

Matched Tone

TRADE MARK REG. U.S. PAT. OFF.

Radio Headsets

© C. Brandes, Inc.

Using the MAGNAVOX

IT is the Magnavox owner who gets the utmost service from Radio.

While the Radio enthusiast constantly strives to better his receiving equipment, Magnavox Reproducers and Power Amplifiers are units which no other apparatus can replace.

The only correct principles of sound reproduction and amplification are embodied in Magnavox construction.

Magnavox Reproducers and Power Amplifiers can be used with any receiving set of good quality. Without Magnavox, no receiving set is complete.

Magnavox R2 Reproducer and 2 stage Power Amplifier (as illustrated) **$115.00**

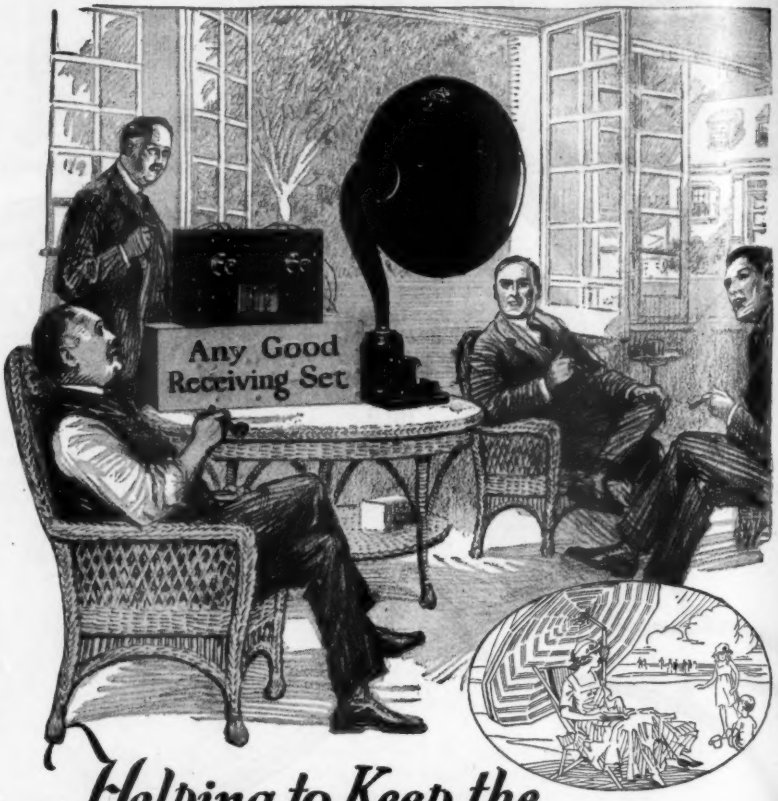
R2 Magnavox Reproducer with 18-inch curvex horn: the utmost in amplifying power; requires only .6 of an ampere for the field **$60.00**

R3 Magnavox Reproducer with 14-inch curvex horn: ideal for homes, offices, etc. . . . **$35.00**

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Reproducer.

AC-2-C, 2-stage, $55.00
AC-3-C, 3-stage, $75.00

7R



Helping to Keep the "Stay-at-Homes" happy

RADIO has banished that dull, lonely evening idea once and for all—the "stay-at-home" nowadays can choose his own brand of entertainment from a number of programs practically every hour.

But a Radio set is only as good as its *reproducer* — make sure you have the Magnavox (electro-dynamic) Reproducer Supreme.

Magnavox products can be had of good dealers everywhere. Send for copy of unusual booklet.

The Magnavox Co., Oakland, California
New York: 370 Seventh Avenue

MAGNAVOX Radio
The Reproducer Supreme

A new battery charger, noiseless and indestructible

FANSTEEL BALKITE is a new metal developed for this charger. It acts as a valve, allowing alternating current to flow into the battery but not out of it. It is the most efficient charger valve made, is practically indestructible, and does away with noisy, delicate vibrators and fragile bulbs.

The Gould Battery Company is also marketing, under the Fansteel Balkite Patents, a complete battery and recharging unit known as the Gould Unipower, into which this charger, under the name, "The Fansteel Balkite Rectifier," has been incorporated.

FANSTEEL **Balkite** PATENTS APPLIED FOR *Battery Charger*

The Fansteel Balkite Battery Charger for Radio "A" Batteries is an entirely new type of electrolytic rectifier, based on the use of Fansteel Balkite, a new and rare metal developed for this purpose. It does away with all noise, cannot deteriorate through use or disuse, has nothing to replace, adjust, or get out of order, cannot discharge or short circuit the battery, and requires no attention other than an occasional filling with distilled water. There are no moving parts, bulbs, or fuses. It will not overcharge, and cannot fail to operate when connected to the battery and line current. It is unaffected by temperature or fluctuations in line current, and will charge a completely dead battery. It is simple, efficient, and indestructible except through abuse.

The Fansteel Balkite Battery Charger will charge the ordinary 6 volt radio "A" battery at 3 amperes, and a 12 volt at 1½ amperes, from 110-115 AC, 60 cycle current. It comes complete and ready for use. Get it from your dealer, or use the coupon below.

Price, $18

FANSTEEL PRODUCTS CO., Inc.
North Chicago, Illinois

Dealers and Jobbers: The Fansteel Balkite Battery Charger does away with complaints and replacement troubles. Write for literature and discounts.

FANSTEEL PRODUCTS CO., Inc.
North Chicago, Ill.

Enclosed please find $18. Send me the Fansteel Balkite Battery Charger for Radio "A" Batteries. If I am not entirely satisfied I will return it and you will refund my money.

Name.....

Street.....

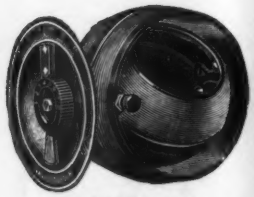
City.....*State*.....

(2)

EISEMANN

VARIOMETER

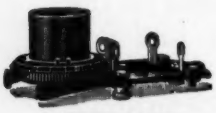
CONDENSER


VARIOCOUPLER

THROUGH the use of Eisemann units and panels the assembly of a receiving set entails less than half the labor customarily involved.

The panels illustrated below are completely drilled and ready for use. The units are simply bolted to the panels—the only tool required being a small screw driver. The panels are of aluminum, which acts as a body capacity shield, and have a crystal black finish.

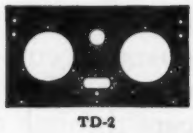
Variometers, variocouplers and condensers, with their matched recessed dials, fit interchangeably into the large circular openings. The rheostat wheels surrounding the sockets on detector and amplifier units extend through the rectangular holes in lower half of panels.


DETECTOR UNIT

AUDIO AMPLIFIER UNIT

T-1

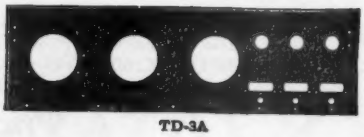
A-2


TD-2

TD-3

TD-2A

METAL PANELS


TD-3A

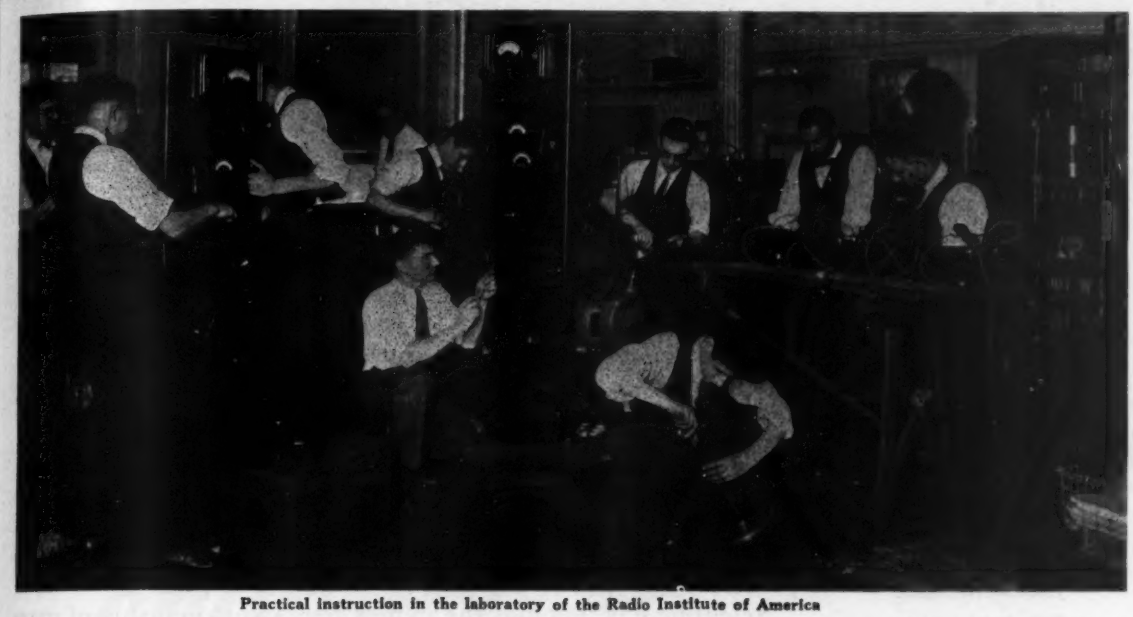
Descriptive literature on request.

EISEMANN MAGNETO CORPORATION

William N. Shaw, *President*

BROOKLYN, N. Y.

DETROIT CHICAGO SAN FRANCISCO



Practical instruction in the laboratory of the Radio Institute of America

THE RADIO CENTER OF THE WORLD

New York City is the radio center of the world and America leads the world not only in the development but in the application of the art of radio communication in all of its branches.

There are twelve high-powered transoceanic radio telegraph stations now in operation, carrying on twenty-four-hour-a-day service with foreign countries; 148 point-to-point limited commercial telegraph stations; 38 general public service telegraph stations in constant communication with vessels at sea; 253 experimental stations engaged in the work of developing the art of radio communication; 2,273 ship radio stations in the American Merchant Marine; 600 radiophone broadcasting stations; 188 special amateur stations engaged in carrying on private telegraph communications across the continent; 18,000 general and restricted amateur stations engaged in the exchange of private communications.

These figures do not include radio stations established on shore and on vessels of the United States army and navy, nor include radio telephone and telegraph stations established on aeroplanes, nor stations established by the Postoffice Department and numerous other departments of the government. It has been approximated from reliable sources that there are over two million radio receiving stations in use at the present time throughout the United States.—From address delivered by Arthur Batcheller, U. S. Radio Inspector.

Think of the tremendous growth in this world wide industry! What is more—think of the great opportunities in this fascinating field! Positions are now open for the trained man-positions as a wireless operator on shipboard in the American merchant marine or with the radio manufacturing companies. Licensed radio men are in great demand.

Train yourself—start now—enroll for the best radio instruction in the United States—given by the Radio Institute of America. We have graduated more than 6,000 students and all of them have secured positions. Not one single graduate remains on hand unassigned to duty. One month's pay after graduation will practically pay for the entire course of instruction. Any one can afford to enroll on our easy tuition payment plan. It matters not when and where you want to use radio knowledge — our course produces visible results. Our class rooms are the largest and best equipped and the instruction most sound and thorough.

HOME STUDY COURSE

If you cannot attend the Institute in person the instruction can come to you through our Home Study Course. Everything from simple electricity and magnetism through to commercial equipment of the latest type and design is completely covered—it secures that first class commercial license. The code is taught by automatic instruments manufactured especially for our own use. Three weeks post-graduate course FREE on the actual instruments as pictured above qualifies you in the most satisfactory manner. Investigate—use the coupon below—it places you under no obligation.

NOTE: The Radio Institute of America is conducted by the Radio Corporation of America, the world's largest commercial radio organization, and is the only radio school in the United States having this great advantage.

RADIO INSTITUTE OF AMERICA

(FORMERLY MARCONI INSTITUTE)

Established 1909

326 Broadway, New York City

Western District Residence School
331 Call Bldg., New Montgomery St., SAN FRANCISCO

Indicate by X the information desired

RADIO INSTITUTE OF AMERICA,
326 Broadway, New York.

Please send me information concerning your
HOME STUDY ☐ } course of instruction.
RESIDENCE ☐

Name.....
Street No.....
Town.....
State.....

Federal Standard Head Sets are made with 2200 Ohms and 3200 Ohms resistance.

Federal makes a complete line of Standard Radio apparatus—all reasonably priced. Write for latest catalog.

Get a Federal Standard HEAD SET

for every member of the family

ADD to the pleasure you get out of Radio by permitting all the members of your family to enjoy it at once.

Family tastes are apt to be similar, which means that when a family favorite is being played or sung, everybody wishes to listen at once. They can hear clearly and distinctly when all the little ones (and the grown-ups, too) have an individual Federal Head Set. The pleasure of each individual will be enhanced by the pleasure of the family as a whole.

Federal Standard Head Sets are fully Guaranteed. Permanent magnets and a uniform air-gap give just the correct diaphragm action, perfect clarity of tone, and durable efficiency.

Scientific winding and the expert hand-workmanship of master craftsmen give exceptional range and power.

Get these guaranteed head sets from your dealer today and refuse to accept a substitute.

Federal Telephone and Telegraph Company
BUFFALO, N. Y.

CONTINENTAL

"New York's Leading Radio House"

THE SYMBOL OF SERVICE

Radiola II—

Build Summer Radio Sales

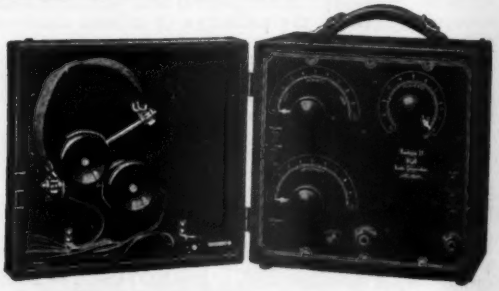
Dealers! Build your summer radio sales with the new portable set—Radiola II.

Light, compact, self contained and economical to operate. The Radiola II is a perfect set for use in camp, on the water, or over the road.

The features which make this set so popular are the use of the UV-199 tubes using flash light batteries, and the neat little folding case which, when closed, is similar to a Corona typewriter case.

Radiola II comprises every development which makes for efficiency and portability.

"Modern Radio"—a new two hundred and eight page catalogue of wireless equipment, supplies and apparatus sent for twenty-five cents.



Specifications

1. Regenerative Tuner
2. Vernier Control of wave length adjustment
3. Detector and one stage Amp.
4. Two telephone jacks
5. 1 Pair Brandes Head Telephones
6. 3 Flash Light Batteries
7. 2 B Batteries

2042-Q

CONTINENTAL RADIO & ELECTRIC CORPN.

6 and 15 Warren Street **New York, U. S. A.**

proven best filament control

—challenges the world

2000 Miles on 1 Tube with a FIL-KO-STAT

From Paul H. Woodruff
Editor Industrial Power, Chicago.

"I am of the opinion that the Fil-Ko-Stat is the best filament control and have recommended it highly. It is a fact that, I picked up two Los Angeles stations, KHJ and KWH with a single tube regenerative detector shortly after installing it."

Recommended and sold by dealers in high quality radio supplies.

Takes the place of your rheostat! Occupies little space on panel. No redrilling necessary.

Made and guaranteed by

DX INSTRUMENT CO. HARRISBURG PA.

PRICE $2

Proven by every test to surpass any and all rheostats and filament controls, Fil-Ko-Stat rightly challenges the world.

Laboratory research proves Fil-Ko-Stat to have a fine adjustment area (which means ability to control filament heat and electronic flow) eighteen times greater than that of the wire rheostat and several times that of the next best filament control.

Actual use proves Fil-Ko-Stat the most acurate control for any tube from "peanut" to "power." Full resistance 30 ohms.

—it has no screws or adjustments to tamper with. It is triple tested and regulated at the factory to the ideal "off" position for

UV 200, 201, 201A, WD11, WD12, UV199, DV6A, W. E. Peanut, etc., etc.

—it is non-microphonic, operates noiselessly, eliminating all "frying."

—it has no disks to break or chip and its reliability and durability are guaranteed by the manufacturer.

If you have never tried tuning with your filament control, start with a Fil-Ko-Stat. It brings in strong and clear D. X. stations you never heard before.

If your dealer has no Fil-Ko-Stats in stock, send his name and your remittance direct to

RADIO STORES CORPORATION
Sole International Distributors
Dept. WA7 . . 218-222 West 34th Street, New York

The filament kontrol of infinite adjustment

FIL-KO-STAT

DISTINCTLY DESIGNED TO UTILIZE THE GREAT TUNING POSSIBILITIES OF THE VACUUM TUBE ITSELF.

"It's real fun to tune-in now— since Jim equipped our set with

ACCURATUNE

MICROMETER CONTROLS

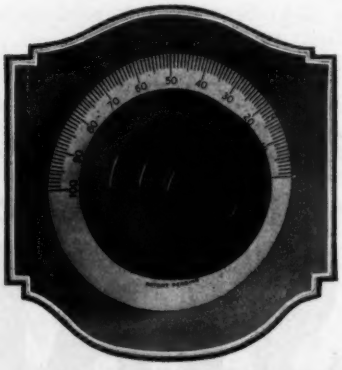
"THERE are no more of those exasperating 'hide-and-seek,' preliminaries that used to try my patience so, especially with the new wave lengths. Instead of waiting till Jim comes home to fuss and fumble with the old vernier things, which I never could master, I can do all the tuning, now, myself.

"You must not confuse the Accuratune with any of those so-called vernier attachments or 'mere dials.' It's a real control, ten times as accurate as any vernier and far more simple to operate. Just by the slightest turn of the micrometer knob I can easily get station after station, clear and distinct, in half the time Jim formerly took.

"As for the cost, Jim agrees we got $3.50 worth of pleasure and satisfaction from the Accuratune the first week we used it. In fact, he was so delighted with it he immediately bought a Fixt-Post Switch and a set of Rheostat Dials made by the Accuratune people, and which match the Micrometer Controls to a 'T'. The appearance of our set has been increased 100% and you can do the same with yours, too."

Universal micrometer action and easily fingered knobs are the outstanding features of the Accuratune Control. The larger knob is used for coarse adjustments, the smaller knob operates the micrometer mechanism. Either action will swing the dial through the full 360 degrees. Your dealer will supply you with Micrometer Controls for your present set, or if you are buying a new set, choose one equipped with Accuratunes.

Manufacturers of popular sets: Equip your apparatus with Accuratune products. Increased efficiency and beauty will advance your sales.



THE MYDAR RADIO COMPANY
9-A Campbell Street, Newark, N. J.

MYDAR RADIO CO.

EVERY ACCURATUNE PRODUCT IS A GOOD PRODUCT

In Our Opinion

THE new schedule of wave lengths for broadcasting stations has now been in effect long enough to establish the fact that Secretary Hoover and his committee did a good job.

The New Broadcasting Wave Lengths

While it has not as yet been possible to tell how completely interference has been done away with, owing to the contracted summer range of all stations, advices from many quarters indicate that so far as local stations are concerned the new plan has brought about a big improvement.

When cool weather returns in the Fall, there will be a gradual increase in the range of broadcasting stations and possibly some interference in the way of heterodyning between carrier waves. But this is a minor consideration, for radio broadcasting is evolving to the status of a great service—not a matter of scientific athletics for the long distance records. If the excellent programs of the stations in each locality can be heard without interruption by the nearby listeners, then the big problem has been solved. DX is relatively unimportant.

* * *

THE analysis of the attitude of the entertainment world toward broadcasting, begun in the June number has been practically completed with the presentation in this issue of a study of the concert managers. It is therefore timely to consider the subject as a whole.

Some Facts in Reply to Critics

First, the assertion is made that receiver makers grow rich on the labors of artists, while the latter have only trouble for their pains. This is so obviously the exact reverse of the truth that it is not worth while to refute it.

Second, there has been an impression that radio keeps people from buying concert and theater tickets, sheet music and phonograph records. Once again, the reverse is the case. It has been proved by numerous tests that broadcasting can and does fill rather than empty the concert halls, the theaters, the household music racks and the record albums.

Third, it is contended that from the point of view of quality of reproduction, broadcasting is atrocious. Candidly, it seems to us that this statement is designed more to injure the new art than to reflect the truth. Today, after some two years of broadcasting, its quality of reproduction already has excelled that of the phonograph. The violin when heard by radio far surpasses even the masterly recordings of Camden, New York and Orange. The string quartet is transmitted with all its rich as well as its subtle tones by radio. Radio transmits with fidelity the playing of a full orchestra or band. The speaking and singing voice is transmitted with fidelity.

Any capable and unprejudiced musical critic will acknowledge that broadcasting in its two years has achieved equal and often better quality than has the phonograph in its twenty-five.

Musical people who are discriminating and also far-sighted are eagerly welcoming radio, the new recruit to the musical forces, for its highly beneficial effects upon performers, publishers and composers, and for its not faultless but really extraordinarily fine quality of reproduction.

* * *

PROBABLY the outstanding program accomplishment in radio broadcasting so far this year was the transmission of the same program by four stations located in four widely separated cities. Linked by long distance wires, WEAF, KDKA, WGY and KYW broadcast the evening meeting of the National Electric Lamp Association on June 7 at Carnegie Hall, thereby rendering the meeting simultaneously available to a large percentage of the population of the country.

Simultaneous National Broadcasting

The time has now arrived when nationally important subjects can be made available to the entire country simultaneously by radio.

* * *

ON the afternoon of May 29 last a memorial service for ship radio operators who lost their lives in the performance of duty was held at the monument erected to their memory in Battery Park, New York, in plain sight of all vessels that come and go through the harbor.

Honoring Radio's Heroes

In these days of great national interest in broadcasting, the more popular side of radio, it is gratifying to record that thoughtful tribute is paid to the memory of these men, who lost their lives while engaged in the parent application and the more essential branch of radio.

* * *

THE transmission by radio of several photographic portraits between Washington and Philadelphia, an airline distance of 130 miles, is something to think about seriously. The successful accomplishment, while limited now in scope, offers possibilities of great development.

Radio Visualization

If there are 2,000,000 receiving sets in operation now, how many million will there be when, in addition to hearing opera, a speaker or the voice of an observer at an event of any kind, the entire performance or event itself can be heard—and also seen?

From what has already been accomplished it takes no soothsayer to predict that most of us will live to see radio delivering at the loud speaker not only the sound of events, but a visualization of them as well.

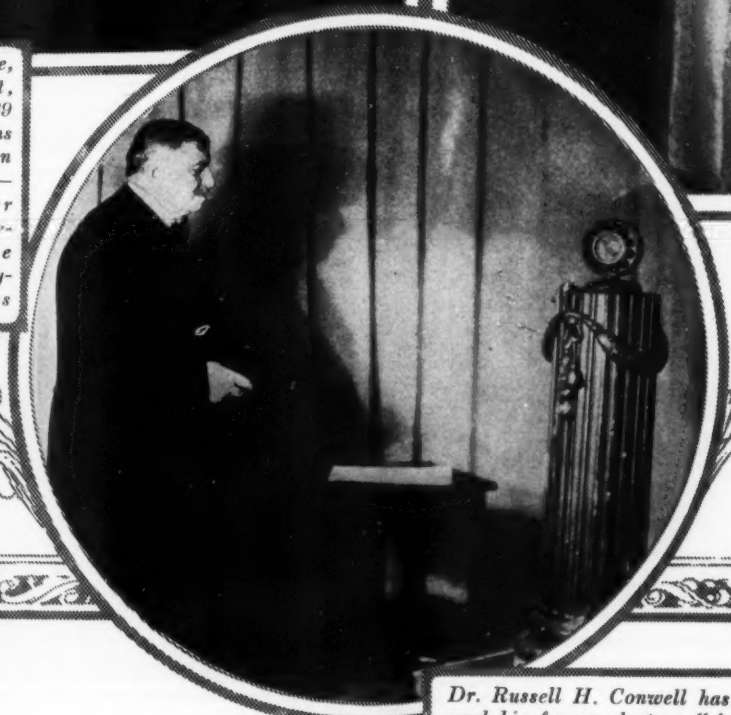
—THE EDITOR.

MARION ARMSTRONG, Scotch-Canadian soprano, has sung but twice for the radio audience, and as a result she has booked many paying engagements. "You either stand or fall by radio, on merit alone," she says on page 35, in an interview

Revealing Some of the Artists You Have Heard on the Air

Patricia Boyle, blind pianist, tells on page 39 how radio means new life in small towns — and how her own radio recitals have helped the playing of others

Josephine Vellanti, soprano, credits some sea gulls, a man, and some honey cakes with inspiring her to sing for the radio. See story, page 37



Dr. Russell H. Conwell has delivered his famous lecture "Acres of Diamonds," twice by radio. As told on page 36 he welcomes broadcasting as an educator of the young

Childhood's Joy Under the Spreading Antenna

If Baby Yvonne Day and Bow Wow spoke slang they would say radio is hot stuff, especially in the summertime! O.K. say we

Verner Alexanderson and his father, E. F. W., reunited by radio, find solace for the anxious hours during the kidnapped boy's absence from parents' home

Radio is mother's helper in the Breslin home, New York City, for Mrs. B. just turns on the loud speaker and Ralph B. not only stops crying to listen but joyously gesticulates with expressive legs

Young Master is English, and he thinks it best to read Curly the Bear a lecture on how to treat pretty little girls. You see, he has just heard "Red Riding Hood" by radio and wants Curly to be sure and see the moral

Celebrities and Sets Prove Radio's Power Over All

Rodolph Valentino thinks radio is great—especially since he used a number of broadcasting stations to tell the world what is the matter with the movies. Here he is seen at WWJ, Detroit

Mayor Rolph of San Francisco gets a Radiola Grand from A. A. Isbell, Manager Pacific Division of the RCA. Officially the Grand is given to the city, but it's the lucky Mayor who listens to it!

Uncle Joe Cannon perhaps doesn't miss the speeches in Congress so much, now that he has become a radio fan in his home at Danville, Ill., to which he, his stogies and his set have retired

Rep. Vincent M. Brennan, R., of Michigan has introduced in the House of Representatives a resolution for the broadcasting of Congressional proceedings. He thinks the people at home ought to be able to hear the debates without coming to Washington. To demonstrate the possibilities he has installed this receiver in his office in the House building.

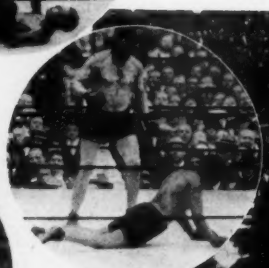
The little radio in your home grew to great proportions when Paul Godley installed this one for the Second District Radio Convention banquet. When he "tuned in" singing was heard from within the monster Paragon RD-5. Everybody voted this the ultimate in sets, and so all were surprised when Margaret Merle, in person, came out on top

Three Knock-Outs Giv

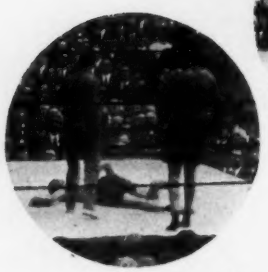
Blow-by-Blow Story of Milk Fund Bouts From Yankee Stadium Brings a Flood of Mail to the Editorial Offices

THREE OF THEM!

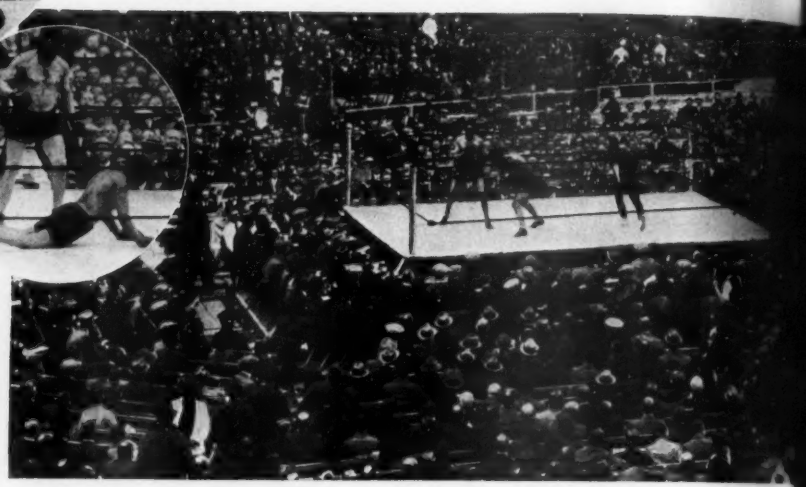
Willard knocks out Johnson



Herman K. O.'s Al Reich



Firpo downs McAuliffe



ON Saturday afternoon, May 12, J. Andrew White, editor of THE WIRELESS AGE, transmitted through WJZ a blow-by-blow description of the boxing bouts as he viewed them from the press box at the Yankee Stadium, New York City. This was the fifth such boxing event that he had broadcast, the others having been the Dempsey-Carpentier, Leonard-Britton, Leonard-Tendler and Walker-Britton bouts. The latest event consisted of no less than five separate bouts, each between heavyweights. In response to the eager audience of his former boxing broadcasts, Mr. White this time described all the contests.

The occasion was a benefit for the New York Milk Fund, which provides milk for the children of the poor. About 75,000 people thronged the Stadium, and the receipts were $390,000, of which about $250,000 went to the Milk Fund.

Probably twice as many people heard the bout described by radio as saw it through their own eyes. Hundreds of letters came to Mr. White thanking him for his work. Easily the most impressive is the one that is reproduced in full herewith, because it shows in a striking way how radio serves to broaden the tastes and desires of those who listen, how it educates as well as amuses them, how in touching all the nation's activities it appeals to all the people.

Dear Mr. White:—

You have placed me very much in your debt by your work last Saturday. I promised then that I would give myself the pleasure of writing you on Monday, endeavoring to thank you adequately, though I fear that would be impossible, for an afternoon of much pleasure, astonishment, and, I am sure, many ultimate benefits. So, the first thing in the office this Monday morning I am keeping my promise to myself.

I suppose I ought to start at the beginning if I am to be able to indicate to you the nature of the debt that I feel runs to you.

First, let me say that until Saturday I was both a scoffer at radio and a despiser of boxing. The confession is due you. I pride myself on being up-to-date, but radio had looked to me like "just another of those fads," while boxing never had been disassociated in my mind from the unpleasant but necessary scraps of my childhood. You see that I had shut myself off from both by preconceived notions.

Then last Friday a friend got under my skin about radio. He called me a "fossil" and a "back number," and said I had no business to criticise radio from the street, that I ought to try it in my own home. The more I thought about it the more I realized that he was right, and so Saturday morning I went to a store and bought a radio receiver, an Aeriola Senior, and also one of those electric light attachments, which the clerk told me I could use instead of putting a wire on the roof, as I was not at all sure that I would want to make any kind of a permanent installation.

When I got home that afternoon it took me no time at all to put this receiver in order on a table by the window in my study. In fact, I had more fun doing it than I can remember since I was a kid, when I monkeyed with the batteries that rang the front door bell and, incidentally, succeeded in putting it out of commission.

However, when I turned the current on, and put on the head gear, I didn't hear a sound, no matter how I turned and twisted the handle on the box, and I certainly was disgusted. Then it occurred to me to check back the connections, and I found that I had reversed the wires to the 22½-volt battery, according to the instructions in the lid of the box. I tore down the whole setup as I had it then, and did it over again from the start, extra carefully, and when it was done I said to myself that if it didn't work then, the whole thing was a fraud.

(This letter is going to be a long one, Mr. White, but I hope you will bear with me as I try to give you the basis for under-

BLANCHE SWEET

"Oh the brutes!"

"Sssh! I want to listen"

"Just hear that crowd!"

Thrills to Radio Fans

Another WIRELESS AGE Broadcast Feature Proves Boxing a "Knock Out" With Radio Audience—the Fifth Time

Glasses and microphone enabled Mr. White to annihilate space as could none of the newspaper men beside him

standing why I feel so grateful to you. I have to put in all the little details. Patience, please.)

Well, to continue, I got the receiver connected up again, every wire according to the instructions, and once more I put on the telephones and twiddled the knobs and the lever. This time I heard a voice, and by working the adjustments a little more carefully, I got it quite loud, and found that it was a radio conversation between two men, talking about the Yankee Stadium. That reminded me that the clerk who had sold me the apparatus had said something about boxing by radio from the Stadium that afternoon.

EMOTION PICTURES

"I'd love to be there!"

"Three, four, five, six . . ."

"My man wins!"

As I said, I thought that fighting was quite beneath my notice, and it was just the thrill of hearing something, anything at all, through this simple little arrangement that kept me listening. "Well, well, it works," was about what I said to myself, and I didn't pay much attention to what I was hearing, at first.

Then a sudden burst of noise attracted my attention. I thought "Aha, this is it. This is some of that howling, interference, etc., that I have heard about. What did I tell you, what did I tell you—" when a voice explained that the crowd had just applauded Harry Drake and Joe McCann who had entered the ring and that the heavyweight carnival was about to commence.

Now, Mr. White, that was an astonishing thing, I assure you. Here I had thought that maybe I might hear a very imperfect program of some sort from a single person, and instead I found myself sitting, willy-nilly, in the midst of thousands of persons. It was very realistic to hear those sounds of a great audience. I have never had an experience like that before. That was thrill Number 2. I began to listen, not to radio, but to an excited crowd.

Then through the noise came a cool, calm, collected voice, unexcited but tense with interest, I should say. I learned later that it was you. The voice began to describe the fight between Drake and McCann, and I kept on listening. It was like hearing in three dimensions. You and I were on one plane, and above and below us were the crowd noises. It was an interesting sensation.

Thrill Number 3 came near the end of the fight, when I heard you say: "It's not all Drake any more, that one punch to the ribs has helped some." That made me realize suddenly that these were people to whom I was listening, and that a dramatic struggle was going on before their eyes. Radio became human, and that was Thrill Number 3.

I decided that I really hadn't been listening at all, and began to pay attention. I heard you describe the bout between Al Reich and "Tiny" Jim Herman, who wore the Indian bathrobe and came from Omaha. In the fourth round, when you said that Herman's eye was cut, I remembered a black eye I got when I was a kid. Radio began to seem not only human, but personal, and I guess that was Thrill Number 4.

Then in the sixth round, through a tremendous noise, I heard you say "There he goes! Reich is down . . . three, four, five, six, seven, eight, nine—Reich is out! He is trying to get to his feet, the referee is waving him to his corner. . . . The blow that felled him was a right to the jaw. He staggered across the ring and dropped to his knees. He tried to rise on the count of nine, but was too weak and the referee waved him to his corner." And so forth.

In all my grammar school scrapping I never knocked a boy out, and never saw one knocked senseless, and I was sure then that boxing was just schoolboy fighting carried too far, but right then you told me this: "As is usual, these knockouts mean nothing to the boxers. It is all over in a minute, and they suffer no injury. Reich is smiling as he gets to his feet and walks out."

That changed things completely, perhaps not so much the words, as the conversational, almost commonplace tone that you used. It was just an offhand remark, one might say. Right then I decided that boxing must be a struggle much like business, in which it is hard for a salesman to lose an order, for instance, but not fatal by any means. Boxing was a struggle, not a fight—that was Thrill Number 5.

While that cornet solo was being played I discovered that I had let my cigar go out—you see!

The Fulton and Renault bout confirmed this discovery when Fulton was disqualified in the fourth round for an accidental foul blow. I guess a lot of foul blows are struck in business without any referee being on the job to hand out a penalty.

I was listening to every word by this time. The bout between McAuliffe and Firpo clinched my decision about boxing. The more skilled man was careless, and the less skilled took advantage of the oppor-

tunity. That happens many a time in business. And then you spoke of a boxing commissioner being alongside McAuliffe after the knockout, and so I guess the State must look after these affairs.

The big event rather surprised me by the evident difference in the sizes of the men, for I had thought that in boxing they picked men of a size. You said of Willard: "What a man he is! He just towers above everybody in that ring. Even sitting down he is taller than his handlers." Of course I felt for the smaller man trying to "bore in" as you expressed it, even in the sixth round when you said that the crowd was booing Johnson for hitting in the clinches.

And what a picture you gave in the seventh round, when you said, very slowly, "Willard—is—not—so—lively now." And in the tenth round, when Johnson reached Willard's face about eight times, with Willard's guard down. And in the eleventh round, when Johnson went down for the count of eight, and finally, amid bedlam, was knocked out for good!

Now you can see what a transformation you worked in me, and why I have had to take so many words to explain it. I can "see" radio now as a highly perfected art, and as an incomparable medium for the transmission of news. I can "see" boxing likewise as a sporting struggle between more or less matched opponents, full of excitement, suspense and alarm, a cross section of life itself, the eternal struggle, in a few minutes.

I feel that I learned a lot on Saturday, thanks to you. It is a rare thing to make two discoveries in a single day. In fact, I had about reached the conclusion that I had made all the discoveries there were to be made, though I never put it to myself quite that plainly. I was just grousing along in a rut without knowing it. Now that you and radio have hauled me over the edge I'm going to explore a bit. Maybe I've been missing a lot of other good things.

I hope I have given you some idea of how great a service you have done me, and that now when I say that I thank you, you will realize how heartily I do so.

Cordially yours,

ALBERT BELMEL.

The "Evening Telegram" Scores a Beat

New York Newspaper Used Broadcast Story of Bouts as Copy for Its Sport Extras

David G. Casem writes it down for the linotyper

BROADCASTING the bouts gave the New York *Evening Telegram* an "edge" on all the other papers. The *Telegram* installed a receiving set especially for the occasion, and it proved so successful that it is kept locked up in its room, secure from meddlers, awaiting the next sporting event to be broadcast. This is the metropolitan daily that makes a specialty of sports, in which field it has earned a great reputation. During the progress of sporting events, frequent editions are printed and rushed to the stands in the crowded centers of the city.

Its Fight Extras on the day of the bouts contained on the front page, the round by round descriptions of the bouts, exactly as spoken by Mr. White. One of these Extras, for instance, contained Mr. White's story of the Fulton-Renault bout, with a credit line: "By WJZ Radio to the Telegram." This is in the right hand column. The two left hand columns on the same page are devoted to the description of the Willard-Johnson bout, also taken down by radio. This was printed on what newspapermen call the "fudge," which is an attachment on the printing press by which last-minute news can be printed on a part of the front page direct from type, without the delay of making stereotype plates. The baseball scores in sport extras, for instance, are usually printed by the fudge in space left for the purpose when the plates for the page are cast. The process saves from 15 minutes to half an hour in getting out an edition.

Minutes count in newspaper work, and A. W. Ford, city editor of the *Telegram* and also a radio fan, decided to try radio in the endeavor to clip a few seconds from the time. A telegraph wire was run direct to the Stadium, for the use of the *Telegram's* boxing writer—this of course was done by all the New York papers, and many from out of town, as well as by the news associations. But in addition the radio receiver was installed.

In actual operation, this receiving set turned out to represent a great piece of journalistic enterprise.

"Mr. White was from a round to a round and a half ahead of the wire," said Ford.

He was highly grateful for the saving of from three to five minutes.

"It looks to me like the greatest medium for the dissemination of news that has ever been invented," he said. "I know now that it is practical. We can save time with it. Just how often it will be useful I don't know. That depends on the broadcasters. The more sporting events they transmit, the better I'll like it. I'm keeping this set here just for that purpose, and if I only get two or three bouts a year through it, it'll be worth it. As I said, it's all up to the broadcasters."

David G. Casem, staff writer for the *Telegram*, was the man who transcribed Mr. White's words.

"You tell Mr. White for me," he requested of his interviewer, "that every word came over clear and distinct. I could even hear him through the yells of the crowd. Believe me, that was some job! I had to sit here for three hours steady, punching this typewriter, trying to keep up with him. It was pretty good 'clean' copy, though. It was dictation, not rewrite."

It must have been a busy office that afternoon. According to Casem, a string of copy boys stood over his typewriter, or rather ran between the machine and the linotypers. "Every time I punched a period the kid would yank the sheet out of the machine and stick another in," said Casem.

Most of Mr. White's words must have been in type within 15 seconds after he uttered them.

Casem is one of those unobtrusive typists who goes about his work without any fuss of waving fingers and hands; he uses the touch system, doesn't raise his hands off the keyboard, and achieves great speed and accuracy. There is only one way in which greater speed than this could

be secured for publication, and that would be for Casem to learn to operate a linotype machine, so as to be able to translate the voice of the eye-witness directly into type.

Perhaps by the time all the other newspapers are using radio to get sporting results the *Telegram* may find it necessary to do that very thing; as it is, it is far in the lead with its radio receiver (a Grebe), its trotting copy boys, its lintoypes, and the "fudge." Radio cuts down to almost nothing the time elapsing between the occurrence of an event and reception of the news.

By the old method of the line wire from ringside to newspaper office, two more steps are involved than by radio, and one more man. There is, first the sport reporter, who writes out his story on the spot. His manuscript goes to a telegraph operator, who ticks it off to another operator in the newspaper office, who copies it. The delay occurs in writing the story in longhand or on a portable typewriter, and in telegraphy, which practically amounts to writing it over again. Then in the office it has to be written a third time, and the linotyper is the fourth man to handle it.

By radio the first two steps are eliminated entirely. There is no writing at the ringside, and no telegraphing. The story is written once on a typewriter, and then goes to the typesetter.

It took the journalistic enterprise of the *Telegram* to realize the opportunity and prove its value.

Correspondents Say "Thank You" in Many Different Ways

Extracts from Only a Few of the Hundreds of Grateful and Congratulatory Letters

HUNDREDS of letters came to Mr. White as a result of his broadcasting of the bouts. In fact, as this issue goes to press, they are still straggling in. Just how many will be represented in the final total is impossible to say, but it certainly will be a large number. In fact, at WJZ, where the popularity of each broadcast feature is carefully watched by tabulating the number of letters, it is stated that these bouts drew more mail than any other one feature for many months. The mail came from all over the Eastern states and from the greatest possible variety of people. Quite a few of them were written on pink, green and blue paper and bore signatures that were as feminine as the stationery and the handwriting. Letters from homes, letters from stores, letters from offices, letters from firehouses, letters from police stations, letters from hospitals, letters from youngsters, letters from ex-boxing and wrestling stars, letters from the world and his wife. Letters and letters and letters!

Broadcasting of boxing bouts of this type reaches many folk who ordinarily do not care much about radio or are indifferent towards it. "One of my friends that listened in with me is going home today with the idea that he will purchase a receiving set before the week is out, just because he got the boxing bouts so clearly and directly Saturday afternoon," wrote Paul Gardner, of Rhode Island. "Before this he used to scoff at radio as he is no music lover and apparently radio had nothing in it for him, but now all is different."

"I had about five hundred in my billiard academy, listening in and five times as many outside waiting for bulletins which I put in the window. I had to close my doors downstairs."—PAUL GROSCH, New York City.

"This was the first time I had ever listened in on the radio and to be perfectly frank I think it has left a bug in my ear. . . . I feel that I can now keep my family contented by obtaining a radio set."—S. T. COLLINS, New York City.

Any number of shut-ins were thrilled by the bouts. "I have always wanted to be at the ringside at a big fight," writes Arthur Rowe Pollock. "But as I am totally blind your explanation gives me more satisfaction than you may imagine, as it enables me to visualize it better than I possibly could at the ringside."

Many correspondents give amazing pictures of the way in which they received the bouts. T. J. M. of New York City reported. "I was able to recline in a rocking chair with a cigar in one hand and my watch in the other, to check off the intermissions, and a kitten on my lap, and see the battle."

Another large class of listeners consisted of those who either stayed home from Saturday afternoon games or motor trips, or who took their sets with them for the purpose of picking up the results wherever they happened to be at the appointed hour. "Knowing that you were to describe the fights

BOILED DOWN

Jess Willard, 248 pounds, former heavyweight champion, knocked out Floyd Johnson, 195 pounds, of Iowa and California, at end of eleventh round.

Luis Angel Firpo, 210 pounds, of Argentina, knocked out John Henry (Jack) McAuliffe, 200 pounds, of Detroit, Mich., third round.

Jack Renault, 190½ pounds, of Canada, won on a foul from Fred Fulton, 214 pounds, of Rochester, Minn., fourth round.

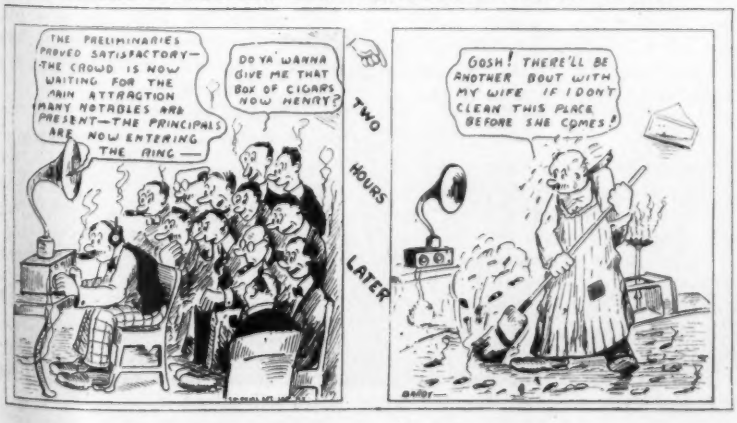
Jim (Tiny) Herman, 218½ pounds, of Omaha, Neb., knocked out Al Reich, 206½ pounds, New York, sixth round.

Harry Drake, 185 pounds, of Staines, England, won decision in a four-round bout over Joe McCann, of Newark, N. J.

The attendance was estimated at about 75,000 and the receipts at $390,000, the profit going to the Milk Fund being probably more than $240,000.

Willard and Johnson each received a fixed sum of $25,000.

IS THERE A LITTLE BATTLE GROUND IN YOUR HOME?


THE PRELIMINARIES PROVED SATISFACTORY—THE CROWD IS NOW WAITING FOR THE MAIN ATTRACTION MANY NOTABLES ARE PRESENT—THE PRINCIPALS ARE NOW ENTERING THE RING —
DO YA WANNA GIVE ME THAT BOX OF CIGARS NOW HENRY?
TWO HOURS LATER
GOSH! THERE'LL BE ANOTHER BOUT WITH MY WIFE IF I DON'T CLEAN THIS PLACE BEFORE SHE COMES!

I went to the trouble of erecting an aerial upon my summer home in Long Island in order to receive the returns," wrote Paul Sternberg.

As usual, a number of sport reporters and telegraphers listened in. "In days gone by I reported on the wire many a reporter's verbal description of various fights," said Charles H. Gersner of New Jersey, "and I feel I know what I am talking about when I say yours today was far above par."

One of the users of pink stationery is Mrs. Katherine B. of Wellington, New Jersey. "I do not think that I would like to see a fight at the ringside," she concludes, "but I sure enjoyed it over the radio."

Mrs. Frieda Marie S. of New York City, confesses, "I never knew or realized how interesting a prize fight could be. . . . Prize fights may not be a woman's line and I do not doubt had I seen the blood flowing I probably would have had an awful shock, but your description of the fight was so very splendid and so perfectly clear, that I now feel like a real fight fan, and so much so that my husband has promised to take me to a fight one of these days so I can see the actual boxing."

A great many radio sets were in dire peril, if many of the listeners were like Harold K. of Jefferson, N. Y., who writes, "If I had not received this important scrap my set would have been in the street."

While the radio dealers in various parts of New York City entertained passers-by, not all of the latter were pleased, according to W. B. Brown. "On my way home," writes Mr. Brown, "I had to pass two radio stores that had loud speakers and both of these stores had such a crowd around them that I had to walk in the street to get by them."

The number of business men who waited until Monday morning to dictate letters in their offices was really surprising. In fact some of them confessed to having listened in their offices. One man wrote that he had installed a loud speaker in the company garage for the benefit of the truck drivers.

All the street crowds were not in the big cities by any means. Arthur S. P. of Nutley, N. J., put a horn out of the second story window, "and many people on adjacent streets listened. One man did not do as much shingling as he had planned, but he became innoculated with radio-fanism, so all was not lost."

"It was a darn fine job" is the way Thomas F. Logan sums it up.

In a conversation with WJZ prior to the bouts, the radio audience heard it stated that William F. Diehl was planning to entertain his club fellows with a loud speaker. Diehl's plans were carried out to a complete success. "Using a regenerative receiving equipment," he writes, "with a Western Electric power amplifier, a water pipe for ground and the chicken wire back-stop of the tennis court for an antenna, the complete description was

Just one of the home receivers through which the bouts were described. This belongs to Chas. Haas, Richmond Hill, N. Y.

heard for a radius of about one quarter of a mile. About one hundred people were present and the players on all the courts heard the description. Several people around the neighborhood sat on their porches and enjoyed the whole program. I have received a letter from the Bayside Tennis Club, stating that they were very pleased with the performance."

Some writers found their vocabulary entirely insufficient. L. F. P. of New York City probably spoke for them all when he said, "Please think of everything that could be said in a congratulatory and thankful way and say I said it."

Most of the letters came from men, but a great number of these expressed appreciation in behalf of their women folk. Elmer J. S. writes "My mother has just returned from the hospital after a major operation, and listened in at the start of the Johnson-Willard bout, so she could root for old age. She had never before shown any interest in boxing matches and the suspense and excitement of this one quite knocked her out. She is still talking about it."

A few writers offered liquid thanks. Edward F. G. puts it this way, "If ever you are in Bayside, come in and we can have a chat and a—(?)" While Anna K. of Brooklyn wishes she "could have reached you quick enough after the fights to hand you an old fashioned schooner." And Al. S., New Canaan, Conn. passes over this invitation. "If you are ever up this way, drop in. Wild-grape wine in my cellar."

Dudley Robinson, who happened to be in New York City that Saturday, is going back to San Francisco a confirmed radio fan. "I shall hope to acquire a radio set strong enough to catch you from the Pacific Coast," he says. "If you could let me know when you officiate again, I will endeavor to get you and eliminate all interference."

"Perfectly peachy" is the comment of Helen E. W., of Brooklyn.

C. W., who lives in New Jersey, writes: "I am an invalid. A few years ago I was able to attend prize fights, baseball and foot-ball, but now I must sit here. Can you imagine what your broadcasting of the fights meant to me?"

Literally scores of correspondents commented on the fact that the yells of the crowd drowned out Mr. White's voice at times. Practically every writer who made this observation added the suggestion that next time a sound proof booth be installed, so that there would be no interruption in the description. Of course, this would be almost impossible, as the booth would obstruct the view of the people sitting behind it. The only cases in which such a booth can be used, are those in which it is possible to locate it at the extreme back of the audience. This was done at a number of foot-ball games last Fall, but at a boxing match the great distance of the observer from the ringside would be too great a handicap.

"My wife has never been strong for pugilism," advised Walter E. Dewey of Pennsylvania. "I couldn't get her into an arena with a derrick, but I notice that she does not miss any of your sending and that she slipped a couple of lady friends into the last matinee. Of course, radio fights differ from grand opera in several respects but probably in none more than that a great many more people enjoy them than will admit it."

Radio Dealers Liked the Bouts—Until They Began!

Many Shut Down Loud Speakers Because of the Crowds That Gathered for the Description

THE opinions of the radio dealers about the afternon's boxing feature were somewhat varied. A few men, here and there, rather complained about the crowds that were attracted to their shops! The trouble was that they were entirely too big.

One dealer on upper Broadway, New York City, said that the bouts spoiled the afternoon, as far as selling was concerned. All he could do was to pack them in and let 'em listen. They were so jammed in the shop that there was no moving about at all. And because the police objected to the street being blocked, he couldn't turn the loud speaker out the window, as he usually does. During a previous broadcast bout he had done so, and stopped the traffic. Since then he is able to turn the programs into the street only when they're not good enough to draw more than a sidewalkful. On Saturday he had to hold it down to a shopful in order to control the crowd at all. Throughout the week, he stated, he had sold sets, parts and accessories to people who were preparing to listen at home.

Another dealer, a cut-price artist, shut his shop door at the first word from White, and admitted customers only. He was not going to lose his Saturday trade—though he confessed to having done a good business throughout the week as a result of the advertising of the bouts.

A shop at 110th Street and Broadway, one of the tiny places, hardly more than a hole-in-the-wall, held some 15 people inside, and a sidewalk crowd that would have spilled over into the street had the police permitted. As it was, "keep moving" was much heard as an accompaniment to the ringside reports.

Stores in downtown New York, which customarily close on Saturday afternoon, held to their usual practice, in most cases. Downtown is deserted at that time, usually, and the dealers had done their big business during the preceding week. They closed their shops with great content. Man after man stated that the broadcast bouts had brought back old customers who needed such things as batteries and tubes to bring their sets up to the mark. Some of them had been neglecting radio, and a really big feature served to bring them back. Also, a number of new admirers were developed.

One radio fan leaned against the counter in one of the pioneer radio stores and said: "Well, it cost me $15 to see those fights. I was five rows back of White, and next time I'm going to see if I can't sit beside him and listen, or else take along one of those portable sets. That would be some combination, believe me!"

Another fan piped up with this: "I stayed home Saturday to listen to those fights, while my wife went motoring down on Long Island. Now, what I want to know is this: can I put a set in my car so I can listen and drive at the same time?"

One of the fair sex drifted into a store Saturday evening, and said that there had been so much noise in the street that she hadn't been able to hear the end of the Firpo fight, and would the dealer "please turn the machine back so I can hear it again?"

Probably the most thrilled and thrilling crowd drawn to a dealer's shop by the bouts was that in and about Radio Reynold's, on 44th Street just off Broadway. One man "got fainty" in the crush and had to be revived in a corner; and outside on the sidewalk the betting ring did a merry dance, decorously but effectively, when the police weren't looking. The locality, in fact, is a center of Manhattan betting, so the police keep an eye on things. Asked if the officers objected to the overflow meeting on the sidewalk a salesman said: "Gosh, no, they wanted to hear the results themselves!"

Various dealers located around 18th Street complained rather bitterly about poor receiving conditions. Interference—this was just before the new dispensation in wave lengths—made a number of them shut down their receivers entirely for the afternoon. At least, so they said. But each reported that a fine afternoon was had by the cash register. "Demonstrations don't pay no more," as one man put it. "We're selling stuff, see, not givin' free concerts. Let 'em listen at home—we'll fix 'em up."

A commuter on the Delay, Linger & Wait was heard explaining to a seat-mate Monday morning that he had turned the loud speaker out of the window and had fought it out with his garden. He said that he thought that the system of resting every fourth minute was a great one for gardeners.

A downtown gyp dealer was full of complaint. "Saturday here it was dead, nobody but just lookers already," he lamented. To a query as to the whereabouts of everybody he answered: "They was home by the fight!"

Motorists in the suburbs were by no means separated from the news. One man learned that Willard won by a knock-out in the 11th round, information given by the garageman at Katonah, where he got some gas.

Patients in institutions everywhere listened to the descriptions of the bouts. These disabled veterans of the Great War enjoyed the program outside their hospital on Ward's Island, New York City. The radio apparatus was given them by the Bill Brown Post, Brooklyn, of the American Legion

Concert Managers Say "Yes," Also "No"

Recital Artists' Future Broadcasting Affected by Attitudes of Organizations Controlling Concert Work—Feeling Runs From Eagerness to Anger—Instances of Complete Co-operation Reveal the Great Advantages of Radio Recitals

By Ward Seeley

AS told in the June issue of THE WIRELESS AGE, all phonograph companies except Victor and Brunswick are willing and even eager for their recording artists to broadcast.

However, important though the attitude of the phonograph company is, it is by no means final. There are other people to be consulted before an artist can sing or play for the radio telephone. There is the concert manager, who has with each artist a contract that may be just as rigid and just as carefully enforced and jealously guarded as are the contracts with the record people. The manager's contract gives him exclusive control of public appearances. Radio might be considered a "public appearance," or to injure the profits of concertizing—and there you are. The concert managers, through their contracts, usually can say whether or not a performer shall broadcast, and where there is no contractual ground for such control by the manager, certainly the manager's influence is sufficient to dictate the attitude that the artist shall assume toward radio.

After all the work has been done with phonograph company and concert manager, there still remains the most important person of all—the artist.

As has been told in these pages for over a year, in interviews with broadcast celebrities, the artists themselves are in many cases quite willing to broadcast, even eager. The attitude of the artists has been spread before you monthly in THE WIRELESS AGE, and it is, in most cases, a sympathetic one, unless the Victor and Brunswick companies have interfered. A few singers, it must be confessed, have stated, *not for publication*, that while they had been perfectly willing to sing for the radio audience during the early days of broadcasting, they feel that now the time is approaching when payment should be made them for their services.

No names will be given here. The confidences of these people will be observed. But for a typical expression of this attitude reference can be had to the interview with Mme. Gadski, on page 33 of the May issue, an interview given under no seal of confidence, and an important one because of the frankness with which Mme. Gadski spoke. Many artists, in fact, when interviews have been sought, have refused to say a word for publication, their attitude being, apparently, that while they would broadcast occasionally, the less said about it the better. In fact, two quite recent cases of this kind, involving a Victor and a Brunswick artist

Maria Jeritza may charm the radio audience on very important occasions, says her concert representative, the Metropolitan Musical Bureau

respectively, were somewhat amusing. Both singers had broadcast—but they professed to be much upset by the circumstance, and wanted no attention called to it. The conclusion was inevitable that each felt that the oftener they sang for the radio audience, and the less said about it, the better!

For many people who have given freely of their time have found that they have been rewarded generously. Many artists who have broadcast, "just for the fun of it," have suddenly found that it pays, not only in pleasure, but professionally. Paying engagements have been secured as a result of radio concerts. Records have been sold, concert tickets as well. To take one instance, May Peterson, the operatic and concert soprano, not only gets a great deal of enjoyment out of her radio performances and the resulting letters, but draws people to her concerts. She has broadcast time and again, and nearly always says that she would be glad to meet any of the radio audience after her next concert at such and such a hall on such and such a date. Hundreds of people have come up to the stage to introduce themselves as "radio friends." That's how Miss Peterson knows that it pays, in dollars and cents, to broadcast.

Because the attitude of the artist has been so well presented in these pages in the past, the rest of this article (with the exception of the broadcasting history of Alma Gluck) is devoted to interviews with the leading concert managers, in whose hands rest the details of appearances on the concert stage. As will be found in the following pages, the managers are by no means unanimous. Some of them are quite rabid when radio is mentioned; some are neutral and are willing to co-operate with the broadcasters if the phonograph companies and the artists are willing; some are eager to take advantage of the opportunities offered by broadcasting; some are just beginning to see the light; some absolutely refuse to say a word. This survey includes the majority of the managers controlling the appearances of the leading artists.

This article completes the picture whose first outlines were presented in the June issue, in the analysis of the policies of the phonograph companies. The reader now should have a comprehensive insight into the three factors of the phonograph, the concert manager, and the artist, that lie behind every visit of a famous performer to a radio broadcasting studio.

Radio Helped to Make Betty Tillotson's Bureau

"I ATTRIBUTE a great part of my success to radio," said Betty Tillotson, of the concert bureau bearing her name.

Miss Tillotson statrted her bureau only about a year and a half ago, and has had a really remarkable success. She started with the determination to

book American singers only, and moreover to promote the ones that were talented, but unknown. If there is anything more difficult in the musical world than to make a large financial success out of promoting unknown American singers, it has never been called to anybody's attention. Miss Tillotson was met with incredulous, pitying or sympathetic smiles, when the other managers learned what she was trying to do—but she is the one who is smiling now. She started with borrowed money and some unknown singers. Today she is out of debt, has a pleasing bank balance and has proven that there is a large audience eager to hear capable American singers. Radio broadcasting played a great part in enabling her to prove that fact. Perhaps it played the leading part.

"Of course," said Miss Tillotson, "my experience with radio has not been always entirely pleasant. Sometimes I would have a concert all arranged and then the manager of the radio station would telephone at the last minute to say that he had just secured some big feature, and that my artist would have to come some other time.

"Sometimes that was rather discouraging, but I really was getting so much from radio that I have stuck to it soundly, and I intend to keep on putting my artists on the air simply because I am getting so much in return, and they are getting so much too.

"I gave up long ago trying to keep up with the mail that comes in after each concert. It is just too big to handle. I always insist that each radio concert be carefully announced as presented by the Betty Tillotson Concert Bureau and that the concert be arranged for sufficiently far in advance so that it gets on all the printed programs. The publicity that goes along with a radio concert is about as valuable as the concert itself.

"Of course it is the artist's voice in the studio that the radio audience hears, but the important thing is to let the audience know whose voice it is and where it comes from, that is to say from what manager. Some of my artists seem to come over very well. There is Louise Loring for instance. The night that she sang the president of the Radio Corporation called up at the studio to say that her voice had come over better than any he had ever heard. That was one of the best evenings I ever had and I did hardly anything else in the studio except answer the telephone.

"I have given concert after concert for the radio and the public knows the Tillotson name now so well that when they see it on their program they are quite sure they are going to get an evening of very high type entertainment. The Westinghouse people themselves in fact have written me that I am putting on the best concerts of any of the managers."

Miss Tillotson was evidently very pleased with the success of her efforts with radio. "How about engagements; have any of your artists secured any engagements as the result of radio?" she was asked.

"Oh yes, I was coming to that. It is really remarkable how many engagements have come out of our radio concerts. Marion Armstrong might almost be called my radio girl, because she has had so many demands for recitals as a result of her work over the radio. She is Scotch, a typical Scotch lassie, and one night for instance, she

Jeanne Gordon, prima donna contralto of the Metropolitan Opera, is managed by National Concerts, Inc., which leaves broadcasting to the phonograph firms and local managers

sang an entire program of Highland songs. The result was that Scotch clubs all over the east and even in Canada and Nova Scotia, wrote in to know if she could be had to sing for them. She comes from Nova Scotia herself and up there they were very eager to listen to her by radio. This Summer she and I are going to tour Nova Scotia for some six or eight weeks, and I am sure that from the mail that has come to her as a result of our radio concerts, she will have a very successful tour.

"In fact, I really consider that Miss Armstrong has been made by radio. Before she came with me she had that magnificent soprano voice of hers, but she had never been able to make it pay because she was unknown. When she came to me and sang for me I realized that if I could get a hearing for her, she could make a considerable success. Radio gave her the hearing she needed, and in the past year she has made more thousands of dollars than she made hundreds a year before.

"I think it is a shame though that the artists cannot be paid for singing for the radio. It is a great deal of trouble to get up a program and rehearse it, and then take the artists down to the studio, and it seems to me that the broadcasters ought to be willing to pay for it. In time I think that will have to come about. Of course right now I am getting so much out of radio that I intend to keep on taking my artists down there. Some of them are beginning to be rather uneasy about it, but I always tell them that they can get a great deal more out of the publicity at present than they can in any other way, and manage to persuade them to sing for me.

"I guess I am unique among the managers. They have been holding meetings for some time and talking about radio and passing resolutions that they would have nothing to do with it, but I have always held out and gone my own way. I guess they think I am nothing but a young upstart, but"—here Miss Tillotson tossed her black bobbed hair with a confident swing—"I am going to keep on in my own way.

"In fact this Bureau was started as a result of a rather disastrous experience with one of the famous managers. I had given him a thousand dollars to manage a friend of mine for a year. During that year he got her one engagement at $15, one at $35, and one at $50. A hundred dollars was all I got back from my thousand. That made me mad. She was an American girl with a real fine voice, and I knew that the only trouble was that this manager was like all the others. He thought that no one but those foreigners could make a success on the concert stage in America. I said to myself that I was going to get that thousand back within a year. That is how I came to start this business. I was a critic at that time, and I have had a pretty thorough musical education. Think I am a good judge of voice.

"All the other managers laughed at me, but I got my thousand back, and more too, with the help of radio. In fact I have paid off a loan of $5,000—that is what I borrowed to start with—and I can walk down the street now and look anybody in the face because I do not owe anybody anything.

"It always used to make me provoked to see all these foreigners coming over here and making big money out of the American public, and then as soon as they had made it take the first steamer back to Europe. All the time there were American singers here just as good if not better. All the American singer needs is a hearing, and if she is good she will have a success that is proportionate to her ability. She has to get a hearing first, and that is where radio comes in."

"No Free Concerts," Says Metropolitan

"THERE is no reason why our artists should broadcast for nothing and sell radio apparatus for these million dollar corporations," said F. C. Schang, manager of the Metropolitan Musical Bureau.

Schang is an intense, vehement and impetuous young man and his views on radio broadcasting are as decided as their expression is eloquent.

"Publicity? Our artists do not want publicity; they want money. They have all the publicity they want, and it does not mean a thing to them. An artist has something (here Schang fingered his throat) for sale. Here he has spent a good deal of time and money making it a marketable product. The artist has a very short season, five or ten years, maybe fifteen, twenty in extraordinary cases. During that time the artist has to make enough money to support him for the rest of his life.

"Why should any of our artists sing for anybody for nothing, especially for the radio, run by these great big corporations that are making millions at selling radio apparatus?

"We have put a clause in our contracts absolutely prohibiting any of our concerts being broadcast without our written permission.

"Of course I can see that in some cases it might be worth while, but it would have to be something very special, like a nationally discussed meeting, at which the President of the United States would speak, and which would be reported in the daily newspapers all over the country. In that case, if that meeting were broadcast, I think it might be a good thing for an artist to sing and have his voice to go out by radio, but even then there would have to be every possible guarantee that the greatest publicity possible would be given through the daily newspapers. I do not care what the radio audience thinks. It does not do a bit of good to perform for them, and in the case I have just mentioned the only thing that would interest me or the artist would be newspaper publicity or connection with a national event."

Schang confessed that despite his very decided opinions on radio, he had never had any definite experience with it that would indicate just what effect radio broadcasting has, if any, upon concert audiences. He said that the attitude of the Metropolitan Bureau was largely founded on opinion and conjecture, upon theoretical rather than practical considerations. It was his opinion, however, that radio broadcasting had materially injured the receipts of well known musicians from all sources. He stated that the concert season just closed had been the worst in many years, that phonograph record sales were falling off, and that it seemed that radio broadcasting could be blamed for this condition.

The Metropolitan Bureau manages a number of truly internationally famous artists. Its list for the coming season is as follows:

Vladimir DePachmann, pianist; Harold Bauer, master pianist; Pablo Casals 'cellist; Ignaz Friedman, colossus of the pianoforte; Francis Macmillen, violinist; Erika Morini, world's greatest woman violinist; Alberto Salvi, concert harpist; Jacques Thibaud, violinist; Carolina Lazzari, concert contralto; Giovanni Martinelli, dramatic tenor; Rafaelo Diaz, noted stylist in recital; Tandy MacKenzie, young American tenor with a most beautiful voice; Anna Case, recital singer; Maria Jeritza, the sensational

Vladimir Rosing, tenor, is very well liked by the radio audience for his broadcast numbers. Antonia Sawyer, who manages his concert appearances, says he gets many cordial letters

prima donna of the Metropolitan Opera Company; Louis Graveure, baritone.

Schang admitted, however, that there was a most intimate connection between concert tours and the sale of phonograph records, stating that no artist sold any important number of records unless he or she toured the country in concert work. The records helped the concerts and the concerts helped the records. They work hand in hand. He cited a number of instances in which artists who did not make any extended concert tour last season noted a decided falling off in their record royalties. Among these cases was that of Alma Gluck, who has had nearly a two-year rest from the concert stage following an unsuccessful season due to singing when her voice was not up to its original quality. She is now considered to have fully recovered and is being booked for next season, when it is to be expected that her phonograph record sales will again rise to astounding figures as a result of her appearances in local concerts throughout the country.

"Radio Is Valueless" —Haensel & Jones

"OUR attitude toward radio broadcasting now is that we feel that there is absolutely nothing in it whatever for us or for our artists," said H. J. Parmelee, manager of Haensel & Jones, New York City.

First Mr. Parmelee did not wish to make any statement whatever for publication, but he finally consented to being quoted as saying, "that while in the beginning radio had considerable value, it now presents nothing whatever to an established artist. In the early days when radio was a great novelty and some real big artists were broadcasting, it had considerable advertising value," explained Mr. Parmelee. "But now when they are getting every Tom, Dick and Harry to go on the radio and when the stations treat us carelessly, it is very seldom that their names get in the papers or on the programs, we cannot see that it has any value at all, and our attitude is that we won't allow any of our artists to broadcast because it is not worth the trouble."

"Radio Promises Much," Antonia Sawyer Knows

"RADIO is nothing that you can laugh down or knock out of business," said Mrs. Antonia Sawyer. "It seems a most wonderful thing, and I am sure that it is just on the threshold of a tremendous development. However, I do think that the big artists that perform for the radio should be paid."

That was her summing up of the situation as she saw it at the end of a very complete interview with the representative of THE WIRELESS AGE. During the course of that interview she and her daughter, Mrs. Antonia Morse, had shown their enthusiasm not only for the romance of radio and for its tremendous service to the public, but also for its value to certain of the musicians whose concert appearances are managed by Antonia Sawyer, Inc.

"Mrs. Sawyer, have you seen any effect of radio broadcasting upon the concert appearances of your artists?" she was asked at the beginning of the interview.

"No, I cannot say that I have; I do not think it has had any influence one way or another. Of course some of our artists have gone over to Newark to broadcast and some of them are very enthusiastic about it. I do not think you will find Percy Grainger so enthusiastic, but Vladimir Rosing is really quite keen about it. He has broadcast by the radio a number of times. I think he does it in nearly every city he goes into. He is a man of very remarkable personality, and it seems to be that the radio audience appreciates him very much. He has received hundreds of letters. I remember that once in Newark he was allowed to speak himself before singing, and that he apologized for his poor English. He got a lot of letters that were very cordial, some of them coming from way up in Canada.

"But," continued Mrs. Sawyer, "I want you to talk to Mrs. Morse, who knows much more about radio than I do."

Mrs. Morse has assisted a number of the Sawyer artists to broadcast and is herself somewhat of a radio fan, though she smilingly stated that she hears so many concerts that she really listens-in comparatively little.

"I think that radio is going to work out in the end just as the phonograph did," she explained. "You know that when the phonograph came along there was a fear that it would injure the concerts, that people who had a phonograph and could hear the big artists in their own homes would not buy tickets for their concerts.

"Now, of course as everybody knows, it turned out to be exactly the opposite thing. The phonograph is absolutely the best way there is at present for making an artist popular. Of course the phonograph requires a great deal of imagination and all you get through it is the voice. If it is a good voice, the people who like it when they hear it through their phonograph, will want to see the artist in person. In other words, the artist that they like by phonograph they will buy tickets to hear at a concert.

"Yes," confirmed Mrs. Sawyer, "that is absolutely true. We cannot book an extensive tour for an artist today unless she makes records. That is the first thing the local manager asks, whether or not the artist makes records."

"The phonograph record is a very important thing nowadays," resumed Mrs. Morse. "It is really a key to a great deal. I think, however, that radio is doing very much the same thing that the records are. Of course it is a little bit different, because with a phonograph you have just a disc while in radio you are hearing the artist herself. She goes to a great deal of trouble, and it seems to me that she ought to be paid for it, and that probably the time is coming, in fact I hope it will come soon, when the broadcasting stations will be able to pay. In fact I have noticed that there have not been any real leading artists broadcasting for quite some months, and I think they have all about decided that unless they are paid by the radio that they will not sing for it. Of course that is not to say that they do not get paid in publicity. Mr. Rosing in particular, seems to have gained a great many friends through his radio performances. He is a man who has an extraordinary facility for making friends of his audience, and that is a great asset. He has done it by radio and I think it has helped him a great deal.

"No, we have not had any experiences that would show any effect of radio on our concerts. All our artists are drawing about the same houses that they always do and as far as we know radio has neither increased nor diminished the box office receipts.

Suzanne Keener, coloratura soprano of the Metropolitan Opera, may yet be heard by radio as her manager, R. E. Johnston, is experiencing a change of heart

"I should think it might in some cases bring more people to the concerts. I do not doubt that Mr. Rosing may have been helped by radio somewhat in that way, but we cannot tell. Percy Grainger of course always sells out, and so there is no need for any assistance there."

Antonia Sawyer, Inc. is an agency that is well known in the musical field, having had on its lists for many years some of the leading musicians. For the coming season it is booking Mme. Anita Atwater, soprano, Phoebe Crosby, soprano, Gabriel Engel, violinist, Percy Grainger, famous pianist and composer who makes Columbia records and Duo-Art rolls; Frederic Lamond who makes Duo-Art rolls; the London String Quartet, making Columbia records, and Vladimir Rosing making Aeolian-Vocalion records. It will be noted that the Columbia, Duo-Art, and Aeolian-Vocalion organizations are all in favor of their artists making occasional visits to broadcasting studios, as described in the June issue of THE WIRELESS AGE.

R. E. Johnston Begins to See a New Light

R. E. JOHNSTON, manager of such artists as Rosa Raisa, the famous dramatic soprano of the Chicago Opera Company; Titta Ruffo, celebrated baritone of the Metropolitan Opera Company and Erwin Nyiregyhazi, the Hungarian pianist, has been known for some time to be much opposed to radio broadcasting. In fact, representatives of THE WIRELESS AGE have been unable to secure interviews with him or with any of his artists except Titta Ruffo.

However, apparently Johnston is slowly changing his attitude as is to be seen from the following, submitted by him to THE WIRELESS AGE for publication:

"Radio is one of the three greatest inventions I have witnessed during my life," said Mr. R. E. Johnston, the manager of many of the world's great artists. "The other two are wireless telegraphy and motion pictures.

"Radio is still in its infancy, but it has already done wonderful things. There is no telling what it may yet do.

"Radio advocates often came to my office, begging for a favorable word, but what I told them they did not wish to repeat for publication.

"Recently, however, I am becoming more favorably disposed towards it. I am beginning to see the light, and that light, which is radio, will surely grow and grow to amazing proportions."

Wolfsohn Writes "No" Into Its Contracts

THE musical bureau having what is probably the largest list of famous names, is the Wolfsohn Musical Bureau, New York City. The Wolfsohn people are dead set against radio broadcasting and all its contracts with local managers now contain a clause to the effect that no broadcasting apparatus is to be installed in the hall in which any concert is to be given.

Milton Diamond of the management explained that this policy had arisen from a number of disastrous experiences in the southwest where various newspapers had installed radio apparatus in local concert halls.

"Those newspapers," explained Diamond, "advertised in their pages that the concert in these halls would be broadcast and that people should stay at home and listen instead of going to the box office, and paying $2.00 or $2.50, and the result was that a great many people did exactly that thing. You can imagine what the result was from a financial point of view." He admitted that one of these instances was in Oklahoma City, that the artist was Alma Gluck whose experience is told elsewhere in this issue. At that time Mme. Gluck was under the Wolfsohn management.

"In other ways the Wolfsohn experience with radio has been unpleasant to say the least. For instance, Claire Dux, soprano, last Spring sang as a guest artist with the Wagnerian Opera Festival. She appeared in 'Die Meistersaenger' and 'Martha,' both of which operas were broadcast. Notice was given to the opera company that the broadcasting apparatus must be disconnected at all times while Dux was on the stage. This was not done, however. The same thing happened in St. Louis, Mo., where Maria Ivogun, singing with the St. Louis orchestra last Winter, was supposed to be kept off the air when the orchestra concert was broadcast, but her voice was transmitted nevertheless." These two experiences no doubt are responsible for the form of the radio clause in the Wolfsohn contracts, the clause stating, not that concerts should not be broadcast, but stipulating that no radio apparatus is to be installed in the hall, thus preventing any similar slip-up of this nature.

The Bureau also is paying careful attention to the desires of the phonograph companies, many of its artists being under contract with the Victor and Brunswick organizations and therefore unable to allow mechanical reproduction of their talent except by the phonograph.

"I think that these broadcasting organizations ought to pay the artists," said Diamond, "and I don't see how they are going to be able to make up good programs until they do. Of course some of the artists do not object to broadcasting; in fact some of them think it is fun, and like it very much. However, with the phonograph company and the concert manager against it, I do not see how the artists can do very much, no matter how willing they may be; and when we point out to them that they may do themselves real injury by broadcasting, not many of them are going to be willing at all. Of course there are exceptions to everything, and I can imagine that in certain special cases it might pay an artist, a phonograph company and a concert manager to co-operate with a broadcasting station, but it would have to be worked out very carefully indeed to make it absolutely certain that the effect would be good and not bad."

The list of the Wolfsohn Bureau artists is entirely too long to print here. Some of the more famous ones are:

Sopranos: Lucrezia Bori, Claire Dux, Maria Ivogun, Louise Homer Stires. Contraltos: Sophie Braslau, Louise Homer, Margaret Matzenauer. Tenors: Mario Chamlee, Lambert Murphy. Baritone-Bass: Reinald Werrenrath. Violinist: Jascha Heifetz. Cellist: Hans Kindler. Pianist: Josef Hofmann. Ensemble: Elshuco Trio.

Hurok Thinks Radio Has Detrimental Effect

ONE of the best known of the managers is S. Hurok, who, like many of the musicians that come under his business guidance, was born in Russia in humble surroundings. He manages the following artists: Feodor Chaliapin, Mischa Elman, Anna Pavlowa, Eugen Ysaye, Schumann-Heink, Alma Gluck, Efrem Zimbalist and a number of others.

I asked Hurok what was the effect of radio broadcasting upon the tours of his artists.

"It is very bad," he said. "People who listen to the radio do not go to concerts. I will not permit any of my artists to sing for the radio."

"But," I objected, "S. L. Rothafel of the Capitol Theater states that radio has made his audience warmer, that the applause is much more enthusiastic when a singer comes on the stage who has been heard by radio."

"Oh, that is only a street audience," said Hurok in rather a scornful tone. "They do not go to concerts. The radio is a terrible thing. It distorts the voices of the artists so no one can recognize them and after they have been heard over the radio no one wants to hear them again. No, no, I will not permit any of my artists to sing for the radio. It would be very bad for their success."

"Just what do you consider the principal elements in making the success of an artist?" was my next question.

"There are three conditions," explained Hurok. "First, the artist must be really big, a great artist. Second, there must be a campaign that will make him known. Third, programs. The programs are very important."

"What do you mean by 'campaign to make an artist known,' just what does such a campaign include?" I inquired.

"Oh, the usual thing, advertising and publicity of all kinds. You have to get the singer's name before the public. We have to sell a singer to the public just as Mr. Gillette has to sell his razor."

"Don't you think then that radio broadcasting might help you promote a new artist, some one who has just come to this country?" was my next suggestion.

"No," said Hurok abruptly, "people who listen to radio do not go to concerts."

The conversation had gone around in a circle. It was plain that Hurok considered the broadcasting station to be a competitor, and that he feared its effect upon the box office receipts, in which, of course, he has an interest that is no less keen than that of the artists themselves.

The very next day confirmation for this analysis of Hurok's attitude came from a totally unexpected source, the New York *Times* printing a long interview with him in the course of which he was quoted as saying that there are not enough concert halls in America, that in the 915 American cities where musical events are conducted during the season from October 15th to June 15th, there are very few ideal concert theaters. Hurok deprecated the lack of adequate facilities for the personal presentation of his artists to the eager audience in those 915 cities. And yet he is eager for still more people to clamor to get into the accommodations whose limitations he points out. He is eager for musical education, but not by radio!

"Music must be popularized," Hurok is quoted in the interview in question.

"People must be educated to the appreciation of music. I believe that *The New York Times*, by printing all the news of coming attractions and by the space given to concerts which are held, is doing more for music than any other organ or organization can do in any other way.

"Music should be taught as a necessary element in our lives. Classes should be conducted in public schools, just as faithfully as geography, history, botany and anatomy are taught. Music is as important to the future life of the child as these subjects are, for it is the greatest thing in our life. It brings happiness to the family, the community and the nation.

"America, in spite of jazz education, offers a broader and more tempting field than Europe for spreading the gospel of better music. Artists of international fame complete the usual concert tour of the Old World in four months. In the United States, under present conditions, an artist can remain on tour for seven years and still not complete the American circuit. This is the field open to an artist today in a country where, only twelve years ago, many cities were yet to be introduced to concert attractions."

It is not difficult to perceive what Mr. Hurok has in mind. Oblivious of the fact that radio is today turning a million homes into concert halls,

Hurok counts as a blessing only the erection of new theaters in which his artists can perform at financial benefit to themselves and to him.

He thinks that radio will tend to empty those halls rather than fill them. That is his opinion and he is entitled to it, just as those who feel differently are at liberty to do so and to back up their opinion by such proof as may be available.

Up To Local Manager, Thinks National Concerts

"IT seems to me that the question of whether or not an artist shall broadcast, can be decided only by the phonograph company and by the local manager," said Miss L. Miller, manager of National Concerts, Inc. "You see the phonograph companies have contracts with most of our artists and some of them contain clauses that the artists shall not broadcast. Then in those cases in which the phonograph companies do not object, we have the local manager, who is in charge of the concerts in his city, and he is certainly not going to allow anything to be done that will injure the success of his concerts."

Right here it may be well to explain the system used in at least a part of the musical world, in booking the tours of musicians. A great many singers are not managed in the larger cities by the metropolitan musical bureaus, instead they are put in the hands of the local managers. In each city of any size in which there is a concert hall, or where artists are accustomed to give recitals, there is at least one resident manager who takes charge of such performers as he is able to book. He makes his arrangements through the artist's metropolitan agent. The relationship is very much like that existing in the commercial world between the wholesaler and the retailer, the local manager in this case being the retailer. In each instance the local manager under such an arrangement is in entire charge of the artist during his or her stay in the manager's city or cities. Thus the local manager would be in a position to say whether or not a visiting artist would sing in the local broadcasting station.

Miss Miller explained that as far as National Concerts, Inc., have been able to perceive, radio broadcasting, has had no effect upon the concert tours of their artists. Some of them have been heard on the air, such as Rosa Ponselle and Florence MacBeth. Others, such as Giuseppe Danise (who is a Brunswick artist) are prevented from broadcasting by their arrangements with the Victor and Brunswick companies.

In general the attitude in the offices

Alma Gluck —her radio experience has been both good and bad

of National Concerts, Inc., seems to be that radio when carefully handled, can be turned to some publicity value for the artist, but that in each case the wishes of the phonograph companies and of the local managers must be very carefully ascertained and followed.

How Alma Gluck Broadcast in Oklahoma

"WELL," said Alma Gluck, "I suppose you want me to tell you all that I know or do not know about radio. I will start at the beginning and tell you about Oklahoma City, how radio ruined the concert for me there. I am rather a spoiled person and am used to having the houses jammed, and a lot of people gathered around me on the platform.

"But when we got out to Oklahoma City on our tour last year the tuner came to me and said, 'Madame, there is no sale,' and I said, 'What do you mean there is no sale, I do not understand?' He said, 'I do not know, the house is not half full.'

"Then the publisher of the leading paper in Oklahoma City called me up and in great excitement said that he had given me a great deal of publicity, that he had had my name on the front page of his paper for the last two weeks and that he was going to broadcast my concert through his radio, and that it would be heard over a radius of 200 miles and so forth.

"I said, 'Well, thank you very much, but I really cannot allow the concert to be broadcast because it would make me very nervous to have anything up in front of me and know that my voice was being recorded.' It always takes much more out of me to record my voice for the Victor Company, to make a single record, than to sing a whole week of concerts. I told him very positively that I certainly could not allow the concert to be broadcast.

"Well, as a result of that, the house was only about one-third filled and I never sang worse in my life than I did that evening. I felt nervous and it was miserable. Then there was a man walking behind a curtain way up in back of the top gallery, and I saw that, and it made me nervous. It was terrible!

"Then the next morning, if you please, that paper came out with a great big scare-head, and said that smarty Alma Gluck would not allow her concert to be broadcast, but that it was just the same; the whole thing had gone out on the radio and everybody over a 200-mile radius had heard it, and it was a great triumph for radio.

"Now you can see that after an experience like that I am not very favorably inclined toward radio. Though even so I have been on the air elsewhere. Down in Atlanta, Ga., they were very nice to me, and after my concert I went over to the station of the Atlanta *Journal*, and sang a single song. In New York they asked me to sing for the radio, but by that time I realized that radio was cutting into the sale of my records and so I telephoned the Victor company to ask if they would permit me to broadcast. Mr. Child told me that he was coming to New York the next day and would bring the answer to that question.

"He came and showed me two records that had been made by someone who had taken them from a radio recital. Now, obviously when such a thing as that is possible it would be unthinkable that I could sing for the radio, because while you can make a record of a record and sell it to anybody who wants to buy it as such, when you have made a record of somebody's voice over the radio, you have made a record of their actual voice."

"Do you think then that radio has actually injured your receipts from records?" her interviewer asked.

"Yes, indeed, it has, because John McCormack and myself lost $100,000 in the last year in royalties on record sales alone."

"Why, I wonder that you allow me in the house!" exclaimed the questioner.

"What can I do?" asked Alma Gluck, with a shrug of the shoulders, "I certainly would not gain anything by killing you! I think that radio is here to stay. No doubt in time it will reach a more reasonable basis, and have more perfect results, but I do not see how an established artist can ever afford to sing for it. Possibly beginners who might be glad to accept $5,000 or $10,000 a year to sing exclusively for the radio, would find it profitable, but I do not see how anyone else would.

"You know that the results of radio are not at all good. I have listened in on my set here and must say that I have never heard any of the voices I know, to be reproduced in such a way that you would recognize them or want to hear them a second time.

"It is too bad! Radio is a tremendous force and I do not doubt that it does a great deal of good for many people, but I do think that they are looking in the wrong direction when they come to the established artists, the phonograph artists, and ask them to broadcast." ———

Local Managers' Head Sees Future Promise

ONCE the artist has found that the recording companies do not object to radio, and has discovered that his or her national manager is in the same frame of mind, and has adopted a similar policy, there still remains one individual who has something to say. That individual is the local manager, who has charge of the local hall.

When an artist is on tour it is the local manager to whom the details are left, except when a performer may be of such world-wide fame and certain success as to enable the employment of a traveling manager or managers to book concerts and look after the many small details concerned. And even in such rare instances the local manager still may have a share in the affair through control of all available halls in his territory.

Here is the situation as it arises during a concertizing tour. An artist is advertised to give a concert, say, in Cleveland; O. A Cleveland broadcaster naturally is anxious to seize the opportunity, and offers or begs the privilege of transmitting the concert direct from the hall. The local manager, however, knowing that all the tickets are not sold, fears that if it is generally known that the concert is to be broadcast, hardly any more tickets will be purchased. He says No, the concert shall not be transmitted. He also says No to the suggestion that the performer visit the studio, before or after the recital, and give one or two numbers.

This has happened scores of times in all parts of the country. It has occurred even in numbers of cases in which all seats were sold long before the broadcasting offer was made, when radio was the only medium left through which an eager public could hear the performance, regardless of how much they were willing to pay for personal attendance.

However, all is not so dark as the above might seem to indicate, for the local managers are divided among themselves on the subject of radio.

Claire Dux, soprano, management Wolfsohn Musical Bureau, was admired by the radio audience despite Wolfsohn protests

Some will permit their concerts to be broadcast, some will not. Some say that the concert itself cannot be transmitted, but if, after a profitable recital, the artist wishes to give an encore or two by radio, that will be permitted—provided that the manager over in the next town does not object to his townspeople listening too.

In an effort to learn the consensus of opinion of the local managers, Elizabeth Cueny, president of the National Concert Managers' Association, was queried. She revealed the fact that despite the general interest of the local managers in radio, the subject has not been discussed in meeting. Here are her personal views, which are well put and are typical of probably a very large number, perhaps the majority, of the local czars of the concert world:

"I cannot speak for the members of the National Concert Managers' Association, as the question of broadcasting an artist's recital has never come up for discussion, nor can I give you anything of value regarding the effect of broadcasting, as no one of my concerts has ever been so treated. It is generally felt, however, that the attendance has been quite seriously affected in the case of others who have adopted the use of the radio.

"It is my personal feeling that no artist who has positively 'arrived' is helped by the use of the radio. I can readily see on the other hand the advertising value to those who require broader publicity, and the benefit to composers in having their compositions heard by a large audience. The radio is still too new an invention for any one to speak with absolute authority on its effect on an artist, or on our musical growth.

"There is no question but what the phonograph has been a great medium in popularizing certain artists and certain compositions, but the phonograph comes nearer reproducing the voice or an instrument than the radio in its present stage of development gives any promise of, and this is a cogent reason for objection on the part of artists and managers to having a concert broadcasted.

"There is nothing in our educational system dependent on the expenditure of private funds, the free enjoyment of which is more generally urged, than music. Enormous sums are spent each year for music appreciation without having as yet made of us a musical nation. Comparatively few as individuals or groups have the natural impulse to burst into song and it can be shown that a small percentage in any community patronize high class musical attractions. Many argue that a prohibitive price is asked for the average concert. It might be said that a prohibitive price is asked for a prize fight or a baseball game, but the public pays for these without quibbling, because they want them. On the other hand concerts at the disposal of the public for 25 and 50 cents have failed to create any great public patronage.

"All those engaged in the promotion of music as an actual livelihood have a very natural objection to investing so much of their own time and money in a project which by being broadcasted places it before thousands, without compensation from any source. To enjoy the phonograph there is a certain amount invested in a machine and in the records—to enjoy the radio a very nominal initial expense is required, which goes to one source only—the manufacturers of radio supplies—not the artist, the artist's manager, or the local manager, to no one, in fact, who is working hard to promote musical interest.

"The local manager has very little to say in regard to broadcasting an artist's recital, this being taken out of his or her hands by the artist, the talking machine company and the artist's manager. I am strongly in favor of utilizing every means to spread the gospel of music, but my personal opinion is, this cannot be effectively done by broadcasting with the radio in its present stage of development." ———

In Reply

READERS will be able to perceive for themselves, no doubt, the occasional glaring errors of statement reported in the preceding pages. The positions of many concert managers are so indefensible that it has not been thought worth while to refute them in the foregoing articles. The reader, instead, is referred to the editorial "Some Facts in Reply to Critics," on page 17. THE EDITOR.

"YOU either stand or fall by radio"—and that is one of its great services to the musical world. It is the new acid test for artists

An interview with

Marion Armstrong

Paid Engagements Resulted From Two Radio Recitals by Scotch-Canadian Soprano

By R. M. Clarke

Marion Armstrong

THERE have been reports going around that one soprano who has been heard on the air just twice has proved so popular that the radio audience has given her many engagements, and well-paid ones, too. Marion Armstrong was the name. If the rumors were correct, we thought, there is a good story here.

The reports were quite justified.

"Radio is like an audition," said Marion Armstrong, Scotch-Canadian soprano, "and you know that the audition is a very important thing for a young singer. Yes, indeed, I have had many engagements as a result of my radio 'auditions,' and in fact I have already booked quite a few more for next season, purely as a result of my two visits to a broadcasting studio."

Confidentially, just for our own information, she told us the number and then swore us to secrecy. Nobody is going to get those figures out of us—but my, what a pity! You'd be surprised. Miss Armstrong was, and pleased, too.

In fact, this is what she says: "I have had a really astonishing success during the last year, and I attribute it to just two things, outside of my own art, of course. One is my manager, who has done wonders, just wonders, and the other is the radio. I certainly attribute a very great deal of my success to the radio. It has given me a hearing before thousands of people, and of course in so many there were some who offered me engagements to come and sing for them.

"I can't understand why some singers refuse to broadcast because they have to do it for nothing. It seems like cutting off your nose to spite your face, so to speak, or something like that."

She sat in her studio in New York City, clad in a simple walking costume of a blue tweed. Just a suspicion of blond curls escaped from beneath a Summery blue toque. And her blue eyes looked at us with direct and frank simplicity from time to time. She spoke slowly, with a slight burr in her voice. She is Scotch, or rather of Scotch ancestry. "The Scotch-Canadian soprano" is the way she likes to have herself known. Her people landed in Nova Scotia, direct from Scotland, just 150 years ago. The Scotch traditions and the Scotch songs still are dear to her folk in Pictou, N. S. She was brought up with them from the cradle, and all her family possess good voices, "though mine is the only one that is trained," she explains.

Now you can see why she has been so successful in singing Scotch songs by radio. They are her own songs. Her heart is in them. She knows that up in Pictou her "ain folk" are listening to her, that Scotch people all over the country and in Canada are listening, and that the old melodies are carrying them back and back. Some of her songs are not even written, and have never been published, being melodies that have been handed down from generation to generation. Many of these she secured from families of the purest Scotch blood, living on a small island near Pictou, where a bit of Scotland itself seems to have been set down in the New World.

Of course she sings other than the old Scotch melodies. Her repertoire includes the more modern concert songs that are so popular everywhere, and she also sings the leading soprano parts in famous oratorios and cantatas by writers of church music such as Handel and Bach. She is a well-rounded concert singer, with the folk songs of her own people as just one popular feature of her recitals.

"My Scotch songs always make a hit," she says. "So many of my letters have been from Scotch people. But for the matter of that, I have had letters of every kind imaginable, some of them very amusing, and some ridiculous. One man even wrote that he was a bachelor, and lonely, and was I as good looking as my voice sounded, and that he had a good income! And a woman wrote that her husband listened in every night so as to be sure not to miss me should I sing unexpectedly, and that she felt the tip ought to be passed on to all wives whose husbands stay out at night!

"But of course, all that was just fun. There is a great deal of fun in broadcasting, but that isn't all, not by any means. Oh, no! I think that radio is doing great things for the people, and even greater for singers. You know that by radio you can give nothing but your art, nothing but your voice. Your personality, which counts for fifty per cent. and maybe more on the concert stage, is not transmitted by radio.

"I think that by radio you either stand or fall. You succeed by your merit. If you haven't anything to offer, any real art, you are a failure by radio. No amount of personality or advertising can bolster up poor art by radio and make it a go.

"That is why I think radio is so important to everybody. It gives a true measure of worth. There is absolutely nothing like it for reaching the people. I am sure that it has taken months and maybe years off my—well, what you might call introductory period."

"That is very interesting," we observed, "because some people think that the radio audience is interested only in what it hears, and doesn't care a rap who it hears, never connects a radio recital, for instance, with the performers."

"Oh, not at all! That isn't so at all!" exclaimed the charming Scotch lassie. "Just look at my case, how many engagements I have secured just by singing twice for the radio! Why, next Fall I will still be filling concert dates that were booked as a result of my radio concert a few months ago!

"Of course, I do think it would be only fair, for the radio companies don't pay the people who sing for them; because they are really selling machines for them. But I certainly have been paid, not by the radio company, to be sure, but I've been richly repaid for broadcasting, professionally, that is.

"It was a lot of fun, too—and also a bit of a nuisance. The last time was in WJZ's Waldorf-Astoria studio, that little Arab tent, you know, with hardly

(*Continued on page* 45)

THOUGH broadcasting cannot replace the personal contact of classroom instruction, its educational influence on the young is highly important

An interview with

Dr. Russell H. Conwell

Famous for His Lecture, "Acres of Diamonds," Which He Has Given Twice Through WOO

By W. E. Johnson

Dr. Russell H. Conwell

"ALTHOUGH the young people are receiving great benefits from the forms of entertainment that are being broadcast today, they are not reaping the benefits that will come to those who will listen in a short time from now," is the prophecy of Dr. Russell H. Conwell, philanthropist, clergyman, lecturer, and author of the famous lecture, "Acres of Diamonds."

That immortal address, which has been delivered to visible audiences 6,102 times, has been broadcast twice from WOO, the Wanamaker Store in Philadelphia, and Dr. Conwell says that since then he has received invitations from stations in Boston, St. Louis and Chicago to broadcast his lecture.

"Just as I reached the invisible enormous army of listeners-in on that occasion," says Dr. Conwell, "so are a number of other people reaching the young folks through the medium of broadcasting. The broadcasting station has become a great public institution, It probably reaches more people than the newspaper or magazine, and it can transmit only such matter as is good and proper for listeners-in, both young and old. If anything objectionable should be broadcast I am sure there would be a storm of protest that would eventually result in the closing of the offending station.

"Chiefly notable at this time is the great knowledge being derived by thousands of boys who are building their own sets, out of what seems to me to be nothing more than a batch of wires and some tubes. Think of the great mechanical and electrical knowledge they are absorbing, which would not have come to them, except through broadcasting. The many forms of entertainment sent out have been inducement for them to build sets and get in on the fun.

"Many stations are broadcasting bedtime stories every night, but as far as I know, I do not think any of them have started to send out Sunday School services. I do not think they should discontinue sending out the bedtime stories, because this is really of great beneficial value to the little tots, and even the older children, but I think Bible stories would be just the things for children on Sunday.

"The stations here do not send out bedtime stories on Sunday evenings. I think this is a mistake. Give the children the stories every night.

"The broadcasting of such matter, however," says Dr. Conwell, "should be at a time when there are no Sunday school classes in session. Many churches throughout the entire country broadcast church services and sermons at the same time that other churches in the same community are having services. I think the church broadcasts should be at a different time from the local services, so that as many people as possible could hear the sermons, personally, instead of using radio as a medium. Radio would then reach those who found it impossible to go to church, without keeping others away from their neighborhood churches."

Dr. Conwell, whose hobby is "Humanity," began life as a poor boy, and though he has made more than $10,000,000 lecturing throughout the country, he is known never to have more than one hundred dollars to his credit at any one time because he gives all his money for the education of young people. He is doing two men's work because years ago a young soldier sacrificed his life for him.

He declares one of the greatest benefits of broadcasting for young people will soon come to pass.

"There are plans in progress at this time," he says, "to have about three hundred colleges and universities throughout the United States and Canada participate in a radio movement that will be of individual benefit to each student. Professors who are leaders in their fields in this country, England, France, and other countries, will broadcast their lectures, and these will be received in the class rooms just as if the lecturer were present. It would be practically impossible for visiting professors, those who are considered authorities, to tour the entire country and reach all the colleges and universities that could be reached through broadcasting. Student listeners-in will receive lectures from noted professors even at big colleges such as Princeton, Yale and Harvard.

"Eventually such a system will probably be installed in the high schools, but I think it will be some time before it will ever be used in the grammar schools. Broadcasting, however, can never supplant the individual teachers in these schools. The personal contact is necessary."

When Dr. Conwell spoke to the invisible audience through the microphone in the WOO studio, he says he experienced a new sensation.

"When I stood up before the microphone the first time, I knew something was lacking. I began to talk in my natural tone of voice. I soon began to feel, however, that I was missing parts of a lecture which I had delivered more than six thousand times. I was even making some slight mistakes. I knew that something had to be done, and quickly, too. I shut my eyes, visioned an enormous audience in front of me, and continued with my lecture without loss of memory or making any mistakes. It was indeed a new sensation.

"I reached an audience far greater than I could have reached otherwise. My family visiting in Massachusetts at the time heard the entire lecture, to say nothing of those in Porto Rico to the south, and Colorado to the west, who heard me."

It is probable that Dr. Conwell will again deliver his famous lecture over the radio. Though he is more than eighty years old, he is head of the well-known Temple University of Philadelphia, which has over 10,000 students, and is also pastor of Grace Baptist Temple. From the church he receives a salary of $10,000, but it is known that after he pays his bills on the first of the month, the remainder of the salary goes for the education of young people. Temple University gets it, as it does the proceeds of his lectures.

He has no radio receiving set. He would like to have one, but he wants nothing but a good one, the kind that "costs two or three hundred dollars, and you know I can't afford one like that," he says.

He is an ardent fan, however, because he has listened-in at homes of friends.

"PEOPLE who are smart catch their ideas out of the air by radio"—for which conclusion some sea gulls in San Francisco Bay are responsible, according to

An Interview with

Josephine Vellanti

Bel-Canto Soprano, Who Has Been Heard From Many Stations in Various Sections

By Edwin Hall

Josephine Vellanti

"REALLY, it was a flock of sea gulls that made me decide to broadcast," said Josephine Vellanti, bel-canto soprano. Thereby she established a new record—or maybe the sea gulls did—for radio inspiration. This is how she explains it:

"I was on the ferry between Oakland and San Francisco one day last Spring and I watched a man feeding honey cakes to the gulls from the deck of the boat. You know how they always fly around a ship? Well, there were fourteen or fifteen of them, but only four or five in the whole flock were clever enough or quick enough, whichever it is, to get the honey cakes, and the rest had to fight over the crumbs. The smart ones caught the cakes right out of the air.

"It was just like life itself.

"It started me thinking. Why, radio was like that! That was the idea that came to me, quite suddenly.

"Radio—catch your ideas in the air!

"People who are smart do it, and right then and there, on that ferry boat, I decided to sing for the radio whenever I could. So I hustled right down to Hale Brothers in San Francisco, and sang for their radio, for KPO."

The San Franciscans responded cordially through the mails. In fact, it was evident that it was a great shame that that man hadn't thrown his honey cakes to the gulls months before. He didn't know at the time that he was not only feeding the birds but actually was furnishing a new performer to some 5,000,000 radio fans.

Soon after her initial gull-inspired performance for the radio telephone, Miss Vellanti's tour took her to Los Angeles. Again she sang over the ether waves. Then she turned back toward home (she lives at Manhattan Beach, N. Y.) and stopped off at Kansas City, Mo. It was a hurried visit there, just long enough for the concert, and for singing in a radio studio.

Then on to Chicago, for a longer stay, with both concertizing and broadcasting to be done. WDAP and WMAQ were visited, and selections sung for the radio audience.

Next, the train for New York—and, once more, arrangements were made, immediately on her arrival, for broadcasting. WJZ gave her some of its time one evening, and the postman thereupon began delivering letters of thanks from a new section of the radio audience. Then WEAF begged for the privilege of transmitting her voice, and so out it went again into the Eastern air.

And that completed what had begun as a trans-continental concert tour, and turned out to be, during the last half of it, a radio tour as well.

The thanks of the radio audiences between here and the Pacific Coast have been expressed most enthusiastically to Miss Vellanti. It is suggested that a man, some honey cakes, and some sea gulls in Oakland Bay also ought to get some letters!

"It was just a wonderful experience to have radio come into my life," said Miss Vellanti, "and so interesting to study it while I traveled back home across the continent. The reactions of the radio audience were rather different in each place, and I really think that I got in better touch with the people than I ever did before.

"That is one of the most wonderful things that radio can do for an artist, get her in close touch with the people. You know that a singer goes out on the stage, and though she can judge pretty well how the audience likes her, still it is somewhat of an indefinite feeling. It's not something that you can get down in writing, in black and white, or in conversation. You just simply have to watch the faces, or rather only a few of the faces that happen to be within range, so that you can study them without the audience realizing it. Then of course the applause helps a lot, it tells quite a bit.

"But it's different by radio. You haven't got the stimulus of the audience, that is true, and there is no applause, except the telephone calls for special numbers, which mean that somebody likes you well enough to want you to sing a favorite number. But you do get by radio what the concert stage hardly ever gives you—just bushels of letters. That's an applause that you can really benefit by. You can study it, and get some idea of the writers, and what they liked or didn't like, and why. Really, it's a valuable guide to the desires of the people, and I think that that is one of the big services that radio gives an artist.

"Of course it isn't at all one-sided, as so many people seem to think. The listeners get a great deal out of it, too. They come in contact with art of all kinds. Even what they don't like may help them, may broaden their tastes. It really is a musical education to listen to the radio, and that is a real service to humanity.

"Do you know, some time ago, when I was laid up with a sprained ankle I read Plato's 'Republic,' and I was astonished to find that that man who wrote so many centuries ago said that you could measure civilization by the people's love of music, and then he went on to say, I can't remember the exact words, that music underwent a noticeable change, usually a severe one, just before and during a war.

"Wasn't that remarkable? Why, everyone knows how music here was changed by the war. Just think, Plato saw the same thing centuries ago, and wrote about it, and there it has been in a book ever since, and I guess most people have never thought of it at all. Even when it was going on right before their eyes, or in their ears, I guess you would have to say.

"Anyway, there is the fact, that music is a gauge of civilization, and has been for just so far back that we can hardly imagine.

"That's why radio is so important to America. I suppose it was really that feeling that lay back of my decision to broadcast whenever I could, when I saw those honey cakes being,

(Continued on page 45)

KFDB—On Telegraph Hill

How a San Francisco Bank Started to Broadcast Crop and Market Reports But Soon Added Entertainment Features to Round Out Its Progress

By Erald A. Schivo

AFTER closing down for three weeks to permit the installation of new equipment, KFDB, the Telegraph Hill station of the Mercantile Trust Company of California, at San Francisco, came back on the air March 20th with its effective power almost doubled and its quality considerably improved.

KFDB is the pioneer high-powered station of the Pacific Coast, and the most powerful. It has an output of 750 watts, capable of increase to 1,500 watts with only minor adjustments, and radiates 11 amperes.

Construction of the station was begun early last summer. It was built by the Mercantile Trust Company of California with the idea that by providing up-to-the-minute crop, market and financial information over the air to the farmers and business men of the states west of the Rocky Mountains, the bank might render a service that would assist in the development of the entire Pacific slope.

Telegraph Hill was chosen as the site of the big station, because of its romantic history as well as its elevation. The hill derived its name from the fact that in the early days of San Francisco, when men from all corners of the world were pouring into California in search of gold, a semaphore station was built on its summit, to signal to watchers in the town below the approach of ships to the Golden Gate.

Although KFDB was originally designed for broadcasting crop and market reports of a strictly utilitarian or educational character, the station soon began to broadcast concerts and other entertainment at the request of a large number of radio fans.

This change made necessary the construction of a studio and the installation of studio equipment, and the concerts have proved to be so popular that the bank is now planning to enlarge its studio and provide a reception room and other facilities. The new buildings which are contemplated will also contain living quarters for the staff of men who operate the station.

Under its present schedule KFDB is on the air three hours every day, two hours every other evening and half an hour Sunday night. From 10 to 11 o'clock every morning crop, market and weather reports are broadcast on 485 meters. From 11 to 11:30 o'clock financial news and quotations of the San Francisco Stock and Bond Exchange are broadcast on 400 meters. The afternoon programs, put on the air from 2 to 3 o'clock daily, consist of public health talks, educational material provided by the United States Commissioner of Education, and like matter.

For half an hour in the evening the station again broadcasts official crop, market and weather reports on 485 meters. From 8 to 10 o'clock every Monday, Wednesday and Friday evening there may be heard the concerts and other entertainment. Every Monday evening the San Francisco Chamber of Commerce coöperates with the bank in presenting a travelogue that usually fills about half the time allowed. These travelogues are original with KFDB.

The following letter attests the unusual result of one of these travelogues:

U. S. Naval Training Station,
San Francisco, California.

6 February, 1923.

Gentlemen:

To begin with, I thank you. The wonders of radio came to my assistance in a most peculiar way last evening, broadcast from KFDB.

I received orders to go to Honolulu, T. H., last Saturday, broke the news to my

(*Continued on page* 41)

The present KFDB studio represents a big advance over the original room, in which only crop and market reports were read. The most varied features now are transmitted

BY radio one young blind girl demonstrated to all her blind listeners that it is possible to overcome their handicap and even to make it advantageous

An Interview with

Patricia Boyle

Blind Pianist

By Sam Loomis

Patricia Boyle

"MY child," said John Barrymore to Patricia Boyle, "you can go so much further in your art than I can in mine, because you have no distractions."

Patricia is blind, and a pianist who has astonished not only the radio audience, but musical critics as well, people who are bored almost daily by the claims of mere talent unsupported by genius, or by appeals to the sympathy instead of to the discriminating musical taste. Patricia is young, and though both she and her mother are loath to predict the future, the fact that Harold Bauer himself arranged a scholarship to enable her to continue her studies speaks volumes for the opinions of experts.

Only time will tell whether the expectations of the critics will come to realization. Meantime, Patricia and her mother, Mrs. Grace C. Boyle, are working away happily at the piano, at literature, at life itself. Working happily—that is just the phrase.

Probably most of the radio audience who heard Patricia play first admired her unusual talent, and then on learning that she is blind, and young, allowed their sympathy to overshadow their admiration.

Certainly I myself thought to write a pathetic story about Patricia. So many blind people listen to radio, and here was one of them, broadcasting to the others. A thank offering, I thought it might be; Patricia's way of giving as she had received and as thousands of blind people have received.

But Patricia won't let me write a single line that is sad. Not that she is dictating the interview word for word. She wouldn't think of even suggesting how the interview should go. Yet in a way she is dictating it, too, in a very definite way, for it is Patricia that I must write about, and not my preconceived notions about a girl in her position, nor the almost universal feeling of the world in regard to just such personal calamities.

So this is not a sad story. Patricia herself isn't sad, and her life isn't sad, and there is nothing pathetic to write about. You may feel badly about her, if you must, but she won't share your emotion.

I have seen quite a number of blind people who think that because of their affliction they can only sit in a corner and vegetate; listening to the radio, if they are lucky; but mainly just waiting while the dreary time passes.

They should talk to Patricia. Some few sightless people have, in fact, after hearing her by wireless. One man, himself a pianist, wrote to her, and then came to call. "What kind of method can you be using!" he exclaimed in wonder at the quality of her playing, and went away with the new hope that he, too, might be able to achieve as perfect a tone as do sighted players.

For tone production on the piano is not a matter of merely hitting the right keys; anyone can do that, even a seeing person can do it blindfolded or in a dark room. It is a matter of touch, or method of attack, or of the position and motion of the fingers, wrists, elbows, the arms and even the shoulders. A blind person cannot see the gestures that are so important in the production of tone. Yet he can learn what they are, and how to use them. One reason why Patricia played, not once but twice for the radio, was to prove to blind pianists who might be listening that it is possible to overcome their handicap.

"I think radio is an extraordinary thing for unifying the nation," she said in her clear young voice, so controlled and musical, and, like her playing, free from restraint. "It brings to everybody the ideas, why the very words of the greatest leaders, people who otherwise would not be able to make themselves heard to more than the very small portion of the nation who live in the big cities. It is especially wonderful for the small town, where they have not had direct contact with anything worth while, up to now."

What do you think of that for an analysis of radio? That's just what Patricia said, simply and easily and naturally and enthusiastically. She may have thought up that speech especially for me, but I doubt it. If a movie star had said it I would feel sure that her press agent had written it for her, but Patricia needs no press agent. She has a mind of her own.

The reason she feels so keenly about radio's service to the small town is that she comes from one, Kane, Pa., and still spends her Summers there.

Kane is proud of Patricia Boyle, and listened eagerly to her radio programs. She started as a local celebrity, having studied piano with her mother. When she was a baby an accident darkened one eye, the other grew dimmer and dimmer, and by the time she was two years old she could just distinguish the outlines of big objects. When she was eleven the last glimmer of light was snuffed out. From then on, her health, which had been such as to cause great concern, began to improve rapidly. She made great strides with her piano lessons.

Kane had been accustomed to be sympathetic, and woke up one day to the fact that it was admiring instead.

That is what Patricia and her mother want. "Of course," said Mrs. Boyle, "we could always secure a certain audience, and perhaps a sure source of income by appealing for sympathy because of Patricia's affliction. She already is in quite considerable demand, by schools and institutions, and so forth, but we rather feel that . . ." She hesitated.

"Patricia would prefer to be judged squarely on her merits as an artist," I suggested.

"Oh, very much so!" exclaimed Patricia decisively.

"Of course we can't tell what the future will bring forth," continued her mother. "She is young, and there is so much to study and learn before she can be said to be a finished artist; the piano literature alone is so voluminous. So we are just working away. . . ."

"They make me work, too," said Patricia gaily. "Why, they even make me do this to loosen up my arms!" And she got down on one knee before the divan and beat it with long, loose-jointed swings of her arm.

"I do hope that the blind pianists who may have heard me by radio realized that it is quite possible for them to get rid of the hard, mechanical touch that most of them have. It isn't at all necessary, and at the school they tell

(*Continued on page* 46)

Radio Broadcast Central

Station WJZ, Now Atop Aeolian Hall, New York City, Has a Brother Transmitter, Known as WJY—Transmit Simultaneously on 455 and 405 Meters—Programs Classified as Classical and Popular

"THIS is station WJZ, Newark, N. J.," is a phrase that is heard no more. Instead, it goes this way: "This is station WJZ, Radio Broadcast Central, at Aeolian Hall, New York City." The Newark station has closed down, and radio fans in losing their old Jersey friend have gained two new ones, in the heart of New York City. For not only is the new station known as WJZ being operated atop Aeolian Hall, but it has a brother, known as WJY. These transmit simultaneously from a double antenna, one, WJZ, on 455 meters, and the other on 405 meters. The first is dedicated to the more serious side of broadcasting, such as addresses of national importance, and classical music; the second is devoting itself to the more popular features. In this way the public is provided with two programs from which to choose that which it prefers.

Officially, the new WJZ and WJY stations were opened by the Radio Corporation of America on the evening of May 14, with dedicatory speeches by Major General J. G. Harboard, president of the RCA; Owen D. Young, chairman of the board of directors; and Dr. Alfred N. Goldsmith, director of research. The first program went over the air the following evening, May 15th, since when both stations have been heard daily.

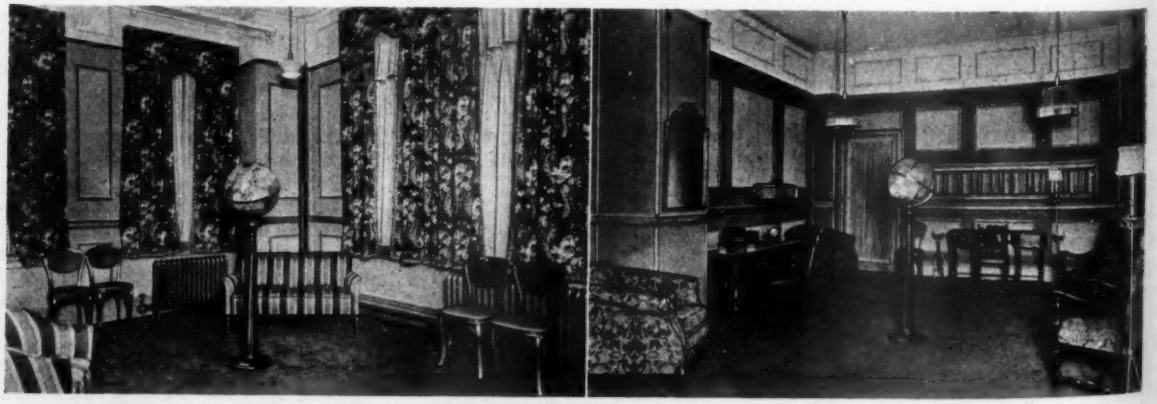
It is a double antenna that transmits the simultaneous programs, divided in the middle. The north half is WJY's and the southern, slightly larger, is used by WJZ

An outstanding fact about these stations is that they are located in the heart of New York City, nationally recognized as the center of music, the drama, sports, education, of finance, and of all that tends to improve and advance one of the greatest countries on earth. In his dedicatory address, Major General Harbord promised that "this station will gather from every part of New York City and from all available sources, all that will instruct and entertain and will hurl it over millions of square miles of territory covered with cities and towns, hamlets and farms, lonely camps and remote settlements, thus reaching millions of homes. And this without regard whatever to race, creed or religion, a fact that marks the art of broadcasting as the most potent agency toward better human understanding and sympathy.

"It is with this thought in mind that I dedicate Broadcast Central to the people of America. I dedicate it with the belief that in a sense this station represents *the world's first national theatre*. For now this great metropolis is able to annihilate distance and offer its best talent simultaneously to all parts of the country from the Atlantic to the Pacific Coasts—talent that will appeal to the serious minded as well as to the gay and light hearted.

"A station such as this cannot fail to become an important factor in the life of the nation, a power in the welding together of thoughts and standards and tongues in short an Americanizing force second only to the Press, a humanizing force second only to the Home."

In all ways the new Radio Broadcast Central represents the height of radio telephone development, and of the collateral arts. It has been under construction for months, and, as a matter of fact, trial and experiment still continue as new ideas and methods and problems present themselves.

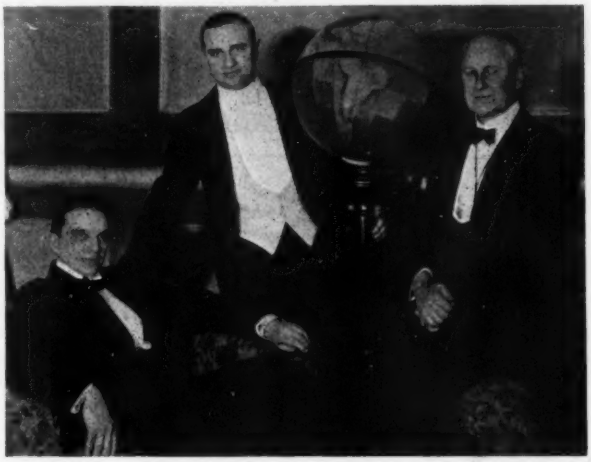


No need to guess which is the high-brow studio and which the popular. Both are operated as Radio Broadcast Central, one (dignifiedly) as WJZ and the other (more informally) as WJY, on 455 and 405 meters respectively. The paneled dignity on the right belongs to WJZ

So far, there are four studios available, two on the sixth floor of Aeolian Hall; one on the ground floor, where is the concert hall itself, from which certain concerts will be broadcast directly; and one in the Waldorf-Astoria hotel. Ample provision has been made for the use of telephone and telegraph lines so that any part of the city, and in fact almost any part of the country, could be turned into a studio temporarily, for broadcasting of events direct from the scene.

Four individual transmitters, each of 500 watts power, are provided in order to make sure that the service shall be reliable. Should one transmitter get out of order, throwing a switch would connect the one in reserve.

There are two complete oscillographs whereby the control room engineers can watch the delicate sound waves being traced in lines of light on a spinning mirror and detect the existence of any faults in the reproduction which might detract from the enjoyment of the audience.



Opening Radio Broadcast Central — Owen D. Young, chairman of the board, RCA, left; Dr. Alfred N. Goldsmith, chief of the research department, center; Major-General James G. Harbord, president, right. The globe encloses the microphone

Considerably more than fifty thousand feet of wire went into the station instruments and wiring, and there are over fifty miles of wire in the outside private wire system for broadcasting interesting musical or other events. Broadcast Central has twelve rooms in all, not counting those rooms at the head office of the Corporation where some of the affairs of these stations are handled. There are four separate and distinct telephone systems within Broadcast Central. One is the usual Bell telephone system with a private branch exchange, one is over the private wire system for broadcasting with its own switchboard, one is a special intercommunicating system between all parts of these stations, and the last is the broadcast announcers' system whereby announcements may be broadcast from various points in these stations as desired. At least eight principal voltages, ranging from 6 volts to 1,000 volts are necessary to run the stations, and steady sources of supply for each of these have been provided.

Every radio listener knows how proud the owner of a receiving set is when he uses at least three tubes to catch the nightly messages. When Broadcast Central is running full on two programs coming from points outside the studios, no less than sixty-four tubes of all sizes from the small receiving tubes to great quarter-kilowatt transmitting tubes are glowing brightly and doing their share in the operation of this national radio theatre. Every wire connecting this multitude of parts had to be carefully planned and designs worked out so that the stations might operate faultlessly when constructed. The drawings of the general assembly of the stations look like veritable spider webs of hundreds of intersecting connections. The radio engineers who have done all this work unobtrusively and willingly will find their great reward in the letters of approbation which, it is hoped, Broadcast Central will receive from its vast audience.

"The work of the engineers at Broadcast Central is not completed," said Dr. Goldsmith on the opening night. "It never will be completed. Not only must the standard of the stations be maintained constantly, but it must be continually improved. It is the plan of the Radio Corporation of America through continued research and experiment to make the stations at Broadcast Central ever better and more effective. Radio broadcasting as shown in the present stations here is a splendid achievement, yet it is only the beginning of a great and never-ending development."

KFDB

(*Continued from page 38*)

wife, who immediately began to advance many objections and for a while I was afraid I would not obtain her consent to accompany me to Honolulu. All day Sunday I spoke of the wonders of that little group of islands, but she insisted that I would naturally try to convince her thus.

Monday evening I tuned in on KFDB just in time to hear the announcement that the officials of the Matson Navigation Company would make an attempt to explain the wonders of Hawaii. I quickly delivered the head-phones to my wife who listened to the entire address, and was so greatly impressed and enthused that she has completely withdrawn all opposition, and I have this date requested transportation from the Navy Department for her passage to Honolulu.

You cannot beat that for a coincidence and a timely "lift" from radio.

Am I in favor of broadcasting? I'll say so.

Yours very truly,
Chief Yeoman, U. S. N.

The Telegraph Hill station employs three 250-watt tubes as oscillators, three as modulators and a 50-watt tube as a speech amplifier. It is so designed that by the addition of another complete set, which has already been installed on the hill, the transmitter may be used as a master-oscillator power-amplifier, and its output increased to 1,500 watts, just double its usual capacity. When the power-amplifier is employed the six 250-watt tubes are, of course all oscillators, and modulation is provided in the auxiliary apparatus.

KFDB is believed to be unique in that the power for the plates of the tubes is derived from a 2,000-volt storage battery instead of a generator. The filaments, originally lighted from the alternating current, now are lighted by direct current provided by a generator.

The antenna system is supported by two 100-foot wooden masts, 90 feet apart. At the two sides of the flat top cages are used, with six heavy wires between them. The lead-in is a cage. An excellent ground is assured as the station has both a counterpoise and an actual ground connection.

At present KFDB has an operating room, a battery room, a generator room, a workshop and a studio building. It is the plan to construct a new building which will contain a large studio, a reception room, a kitchen on the ground floor and living quarters for the staff on the second floor.

The Ideal Program

GREAT interest has been shown by readers of THE WIRELESS AGE in its analysis of the average program as presented in the May issue. As the July number goes to press, questionnaires are still being received in every mail. No tabulation of them has been attempted as yet, the Editor preferring to wait until it seems certain that the "vote" is all in. It is hoped, however, to present in the August number a report that will include the hundreds of questionnaires received thus far, and those that may reach the Editor up to and including July 1.

How Age Wonders at Youthful Radio

"It's the Fiddlin' I Like"—Crippled Mrs. Cutting, 97 Years Old, Enjoys Broadcasting and Her Pipe as She Sits Happily at Home—

By Marie de Fleury

"GOOD evening, Mrs. Cutting, I hear you have been enjoying the radio programs."

"Well, miss, it's the fiddlin' I like. You know my boys fiddled when they were young. I had two that fiddled. I don't always understand the talking but it's the music I like."

I had just stepped in to have a little visit with Mrs. Cordelia Cutting whose appreciative letter to S. L. Rothafel, director of the Capitol Theatre, will be remembered by those who listened to WEAF one Sunday night last Spring. She is a dear, bright old lady living in a sunny New York City apartment with her daughter and son-in-law. For the past six years she has been unable to move without help, as she broke her hip in 1917, while doing war work.

"You see, miss, my son-in-law, he's a radio engineer and he made me this set. It's a bit hard to understand how 'tis this music comes in to me like it does from out the air. I don't try to understand how in the world they do it, but I know how to enjoy it! It helps to pass the time. Why I stay up 'til one and two of the clock nearly every night. Last night, after I had gone to bed I had to stay awake and listen to Detroit to hear the beautiful music."

"Don't know how in the world they do it"—but she doesn't need to! Mrs. Cutting smokes her pipe and sews, and mostly listens to the radio. It's her one big, constant contact with the world

You can easily guess that Mrs. Cutting is one of the greatest radio fans in the wireless audience. She has been a constant listener for the past six months and is one of the most appreciative of them all. As she listens she sits in a big chair by the window, doing feather stitching on beautiful patchwork quilts, all aglow with color. Her white poodle Bessie and her cat cuddle at her feet. Truly a "homey" picture!

"Radio helps me pass the days and I just sit here sewin' on my quilt and smokin' my pipe and listenin' in, as they calls it. I can't quite work it myself but I can hear it. You have to be doin' somethin' when you get old like me, I'm 97 I guess if a day and I can't sit here doin' nothin.' And I can smoke right along."

"I smoke too, Mrs. Cutting—just a cigarette now and then."

"You smoke cigarettes, eh? Well, in a way, that's smokin' too. I thought it would make me sick but it didn't and I like it. I've smoked for these 50 years, ever since the old time when I lived in Canada."

"Oh, you've lived in Canada! I've never been so far north."

"Yes, indeed, I was born in Canada, on the Black River at St. Marks, near Sherbrooke."

"Perhaps you went to a convent?"

"No, my people were too poor for that but I learned both French and English right along together. Eh? You speak French? *Vous savez les petites chansons de ma jeunesse?* I used to sing a lot when I was young, little French songs like: *'Oui, il y a longtemps que je t'aime, jamais je ne t'oublirai.'*

"O, mademoiselle que je suis contente de parler Français avec vous!"

"Do you ever hear French songs on the wireless?"

"Not much and unless I know them I can't understand the words. But it's wonderful to hear the real old songs on the radio, the old timers like 'Home

(*Continued on page 46*)

New York City.

Dear Mr. Roxie:

I am an old lady 97 years old and an invalid. Have not walked since 1917 when I fell and fractured my hip. I was doing my bit to help the soldiers and I had this misfortune and now I have to sit in a chair all day long and life is long and lonely and I have lost the use of my left arm, but I can see and hear as well as ever, so thank God for that for Sunday I listened to you talking over the radio that my son-in-law made for me. It is one that we hear all over the apartment on a loud speaker. My daughter tuned in WEAF broadcasting from the theatre that I have heard so much about but have never seen. The Capitol Theatre, and I enjoyed the music so much and the selections which were sung by, as you called them, beautiful Betsy and Louise and The Blue Blonde and one selection which they sang I love very much, "Mighty Lak a Rose" and a Southern song. What wonderful things I have lived to see and hear, the Radio, and I love Station WEAF and you for you are so cheerful that it makes me feel better for a while. I do hope that you talk again next Sunday and if possible to have Betsy and Louise sing for me "Old Black Joe" and "Darling, I am Growing Old." The two sing together. I thank you.

I try Tongue Twister, but I cannot win, but my daughter promised me that when warm weather comes she will put me in a taxi and take me to the Capitol Theatre. We have no automobile. My daughter is very good to me. She said that she would ask the Manager of the theatre if he had a wheel chair so they can wheel me in the theatre so I can see once more a moving picture and hear the wonderful music there and see the beautiful theatre. Now Mr. Roxie please talk again to us over the radio through the courtesy of WEAF.

Mrs. Cordelia Cutting.

"Pay if You Profit," Say Copyright Owners

American Society of Composers, Authors and Publishers States Its Case —Demands Fees for Radio Use of Its Music Only When Broadcasting Is Done for Profit—Court Action Desired to Settle Question

A Statement by E. C. Mills

Chairman of the Executive Board, Music Publishers' Protective Association

LET me say, first, that I have no official connection whatever with the American Society of Composers, Authors and Publishers; I receive no salary or compensation whatever from that organization, and my interest in the matter is purely and unselfishly in behalf of the fair and just rights of the American composers, authors and publishers of music.

There are two sides to most questions; most of us are more or less prone to think that our particular side is the only one; be that as it may, and in simple fairness to all interested, it is suggested that the reader inform himself now on the "other fellow's" side, which, in this case, is ours.

First, let me clear away some of the unfortunate misunderstanding, which in some cases almost approaches bitterness, existing as between many of the broadcasters, the radio audience, and the copyright proprietors.

The press of the country loves a flamboyant, a dramatic headline. Much of the comment in the public press has referred to a "battle," or a "fight" between the copyright proprietors and the broadcasting interests.

The facts are that there has been no "battle," and there will be no "fight" in the sense conveyed by many of these articles. What there has been and will continue to be is the demand by copyright proprietors that broadcasting stations shall not violate the laws of copyright giving protection to the works of these copyright proprietors.

Maintaining that these demands are lawful, that they are fair, right and just, the copyright proprietors in question are prepared to submit their rights to the adjudication of the Courts, and to bow cheerfully to whatever decision is there made.

The purpose of copyright is to vest in the creator of original musical works, an exclusive title to his creation, to the end that if it be meritorious he shall profit from having created it.

Included in the exclusive rights conferred in the author and composer is that of "public performance." Stripped of legal verbiage this simply means that the author and composer, the copyright proprietor, shall have the *exclusive* right to publicly perform the work which he has created, and as such exclusive owner of this right he of course possesses the right to authorize others to publicly perform his work.

As to certain types of compositions the said *exclusive* right of public performance is vested in the copyright proprietor *only* when the performance is **"for purposes of profit"**; but, as to other types of musical works, the right is exclusive to the copyright proprietor whether the purpose of public performance be profit or not. I will not confuse this present article with a lengthy dissertation on the technical legal differences involved, as it is the policy of these particular copyright proprietors not to invoke their rights except where the purpose of public performance is, in fact, for profit.

FROM THE OPPOSITION

Up to now the American Society of Composers, Authors and Publishers has been silent in the midst of the confusion created by its demands for fees from the broadcasters. The Society now presents its case to the public through the mouth of Mr. Mills, whose communication, prepared especially for THE WIRELESS AGE, needs no criticism or comment from us.

It should be added that by the time this issue reaches its readers, the matter of the broadcasting of copyrighted music will probably be in the courts, with Station WOR as defendant. At least, at the moment of going to press such a suit is being prepared, according to unofficial but trustworthy information.

The Editor

It should be of interest to Americans to know that when the Constitution of the United States was written, Article 1, Section 8 provided that Congress should have power to grant for limited periods, these exclusive rights to authors and inventors. For more than a quarter of a century musical compositions have enjoyed the protection of copyright as to public performance. In enacting these laws Congress has had an eye single to the development and encouragement of American music, insofar as musical copyright was under consideration; and they have been enacted without pressure brought to bear by the authors and composers of music in this country.

The rights involved have, therefore, the sanction of law, and have been tested by years of experience; they have been found to be just, equitable and fair to the whole people, and to all interests.

Now, let us get down to consideration of the rights of these copyright proprietors as to the public performance; by radio broadcasting, of their works.

In the first place, their demand for license fees is made as against only stations that in their opinion operate "for purposes of profit." All stations which can clearly show that profit is not the ultimate object of their broadcasting are granted licenses, under the present policy of the Society, without any charge whatever, and a considerable number of such licenses have been issued.

If, then, a station operates "for purposes of profit," is there any argument to be advanced as justifying it in making illegal free use of copyrighted music?

The principal argument so far advanced by stations is that through broadcasting they advertise the musical compositions, make them popular, and thus create a demand for the sheet music, phonograph records, player-piano rolls, etc., enriching the copyright proprietor accordingly.

Though this claim is not proved, let us, for the sake of argument, grant that it is entirely true. What of it? It would be just as reasonable then, for theatrical producers to dramatize a novel and refuse to reimburse its author, alleging that through its dramatic presentation sales of the story in book form were increased. No reasonable person would argue that such premises were sound, morally or legally.

Nothing is more certain than that the creations of a human mind, its original thoughts and conceptions, in literary or musical form, should be the property of the creator; to hold the contrary would be to discourage original thought, to impede human progress, to stultify mental development. Radio itself is a creature of patent rights—and patent is but copyright granted useful inventions.

The radio broadcasting station is not asked or requested by these copyright proprietors to advertise their works by broadcasting them.

On the contrary, radio broadcasting stations are asked to pay, if they make use of

SKETCH FROM LIFE

Jimmy says he doesn't mind being sick, now
—*Cleveland Plain Dealer*

the works of these copyright proprietors for purposes of profit, a reasonable fee for such use. If they do not use the music they are not expected to pay. If they do use it they should pay, especially when it is remembered that instead of radio making music popular, music has made radio popular. The shoe is on the other foot.

Practically all broadcasting of importance is rendered by volunteer singers and players, quite generally ambitious aspirants who seek publicity through this means. That is perfectly legitimate and proper. But, the overwhelming majority of recognized artists will not render their services free to broadcasting stations. Now, if it is to be argued that through advertising them, the broadcasting station is entitled, as a matter of right, to their services free, then we are in a peculiar situation indeed. If the stations have a right to confiscate musical works to their uses, based upon the argument that they popularize them, why shouldn't they demand as well the right to the free use of singers' and musicians' services?

It is apparent that if a station wishes to broadcast an artist that will not render services free, that station either has to do without the artist, or pay him. So it is with the music itself; if they wish to use it, they should either pay for that for which payment is required, or not use it. It is unfair, and unlawful, to make such an appropriation, as a matter of vested right, except with the assent of the owner of the property.

Another argument advanced by the radio broadcasting stations as justifying their refusal in some instances to recognize the rights of copyright proprietors and compensate them, is that the broadcasting station derives no *direct revenue* from the operation of broadcasting, but that, on the contrary, it is rendering a public service, without fee or charge, when it broadcasts.

It is undeniably true that the radio broadcasting station derives no revenue *directly from the operation of broadcasting*, and therein lies the essential weakness of the whole situation.

Just how long the radio audience of this country will continue to accept free entertainment, instead of insisting on paying for what it receives, no man can tell, but until it does pay a fair fee for the service it receives, radio will be in a state of uncertainty and disorganization. The day is rapidly approaching when broadcasting stations will have to make huge appropriations with which to pay the talent which renders services, or as an alternative, the radio audience will perforce have to be contented with the offerings of amateurs who are willing to work free.

Musicians' unions over the country now have under consideration resolutions forbidding their members to work free for any broadcasting station, just as they in many cases now prohibit their members from participating upon a free basis in any benefit performances, regardless of the cause for which given.

So, too, the recognized vocal and instrumental entertainers of the country will soon cease entirely to render their services at broadcasting stations, unless they are paid for, and it is quite proper that this should be so.

Does any reasonable person argue that a broadcasting station would be operated by a department store, by an electrical concern, by a newspaper, etc., except for *purposes of profit?* The purpose may be concealed as "advertising," "expense," or something of that sort, but if broadcasting is done, the ultimate purpose is profit, or it would not be done.

If, then, the purpose is profit, why should not all elements that contribute to that purpose be compensated? Especially is this true when the element in question is the one without which the operation of a popular broadcasting station becomes impossible.

There is much more music available for unrestricted use than is restricted. Why, then, demand the right to use the restricted music and refuse to compensate the composers and authors? Is it because there is such great demand for this music? If that be true, then the demand surely was not created by the broadcasting station, and if this particular music be essential to the successful operation of the station, all the more reason why it should be paid for.

The facts seem to be that the entire radio situation is, as yet, unorganized, undeveloped, and that, for the present, there is necessarily some confusion and chaos. We do not wish to add to it, we rather wish to aid in eliminating it.

Now, let's see what this group of copyright proprietors did when the radio situation developed to a point where it warranted consideration of their rights.

The first thing done was to serve upon every broadcasting station of record, a notice of their rights, an explanation of the legal phases of the matter, and an invitation to apply for license in event the stations wished to use the material of these composers and authors.

The next thing done, in view of the general confusion, was to summon a conference between representatives of the principal broadcasting interests of the country, and the representatives of the composers and authors who asserted these rights.

That conference was attended by thoroughly representative interests; it was reported verbatim, and the minutes were printed and copies thereof sent to every licensed broadcasting station in the country.

At the conference not a single exception was made to the rights we asserted; on the contrary, the leading broadcasters agreed that we were asserting but just and reasonable rights; and their only objection to recognizing and compensating those rights was based upon the fact that it would mean an added burden of expense, and doubtless establish a precedent under which the artists, singers and musicians, would cease rendering volunteer services and demand payment. It seemed apparent that if the broadcasting stations were to assume these vastly increased expenses, they would have to derive some revenue directly from their broadcasting operations, instead of depending upon the profits flowing from the sale of radio apparatus to justify the continuance of operations.

Be it said to the credit of the larger stations, that their position in the matter was consistently honorable and just; some of them said that they could not afford to pay for our music, and would discontinue using it, thereafter confining their programs to unrestricted material. With that we had no quarrel; if our merchandise is not used, we certainly do not wish any compensation.

Some of the other stations, feeling that they needed our product, decided to use it, secure our license, and pay us for it. That, too, was entirely fair and just to all concerned.

And, some stations decided that they would "fight" (the word is theirs, not ours). Those stations however, were not represented at the conference, and they seem to take the position that they ought to be given the right to use our product as they see fit, without any compensation whatever. They have organized some sort of an association, engaged an attorney, and are preparing their "fight." Well and good; the courts are here for us all. They are here to render justice, and we haven't the slightest fear that they will do so, and should it so transpire that the courts rule we have no such rights as we now assert, we will certainly, as loyal citizens, bow cheerfully to the verdict.

Some threats have been made; why they should have been I don't know. They are of this nature—that these broadcasters who seek to make unlawful use of our material will themselves make popular the musical works of such other composers and authors who do not assert these rights. This does not in the slightest degree interest us, and they are entirely within their rights in so doing. We are not concerned with what they do with music of that nature; if they can "make" it, well and good, and we wish them luck. We prefer that they do not "make" our music—let us do that.

For the vast radio audience we offer this thought: that the sooner its members begin to work out some scheme whereby they will pay for the service that is in the air, the sooner that service will be organized along worth-while and consistent lines; and the longer they defer doing so, the longer will radio be dependent upon the charity of artists and musicians for the material broadcasted.

And, I would suggest consideration of the situation that will exist when the market for apparatus has reached approximately the point of saturation, and when the revenue derived from the sale of apparatus is insufficient to justify the continuance of broadcasting by the large commercial stations—what then will happen? And, don't fool yourselves, the day is nearly here when all artists will have to be paid or they will not broadcast, and the artist who does broadcast free will be recognized as simply an ambitious amateur. Is that sort of entertainment going to suit and satisfy the radio audience?

Better, far better, to demand the best and *pay for it.* You won't get it free. You have already had more service free than was ever rendered in the world before along any similar lines.

The men and women who write the music of this country and are members of the American Society of Composers, Authors and Publishers, ask only from radio what they conceive to be just and fair; I am certain that radio, in the long run, will be happy to render to them their just dues.

Building G-E Station in Oakland

WORK has been started in Oakland, Cal., on the broadcasting station that is to be operated there by the General Electric Company. The station will be located on East 14th Street, near the new General Electric factory building. This location was chosen because of its technical advantages from an electrical point of view, and because of the proximity of the site to San Francisco, which is across the bay and is the great commercial, musical and artistic center of the Pacific Coast.

The plans provide for a two-story brick building to be devoted entirely to the broadcasting station, the first structure of its kind on the Pacific Coast. On the ground floor will be the offices, a reception room and a power plant, consisting of motor generators and storage batteries. On the second floor will be two studios, the main studio large enough to accomodate a band or a symphony orchestra while the smaller studio will be used for solos and addresses. It is probable that an auxiliary studio will be secured in San Francisco and connected with the station by means of telephone lines. By the use of two or more studios it will be possible to make the programs continuous, without any breaks for such things as arrangement of chairs or the ushering of performers from the reception room to the studio.

Instead of placing the antenna directly above the studio building, it will be located one thousand feet away, and will be strung between two steel towers each 150 feet high and 260 feet apart. Beside one of the towers will be placed a power house, in which will be located the antenna tuning apparatus. The station will put 1,000 watts in the antenna. All the electrical parts are being provided in duplicate so that should one break down, it will only be necessary to throw a switch in order to connect a perfect piece of apparatus. Instruments are now being manufactured by the General Electric Co. in its plant at Schenectady, New York, and it is hoped to have this new station in operation this Summer.

Marion Armstrong

(*Continued from page 35*)

enough room in it for a piano and yourself. When I first walked into that little tent I felt all wrapped up in cotton batting, and it was close and stuffy, and I could just feel my throat all shriveling up. And then the microphone was put too far off, it seemed to me, for when I sang over in Newark it was much closer. So I reached out to draw it nearer, but Mr. Harrison, the announcer, quickly grabbed it away and wagged a finger at me as if to say 'naughty, naughty!' But I soon adjusted myself to all this.

"I used to sympathize with the artists who got indignant about singing for nothing for the radio, but not now. You give a great deal, but you get a tremendous amount back, and I think they are cutting themselves off from a very good thing."

Her people in Pictou heard Miss Armstrong each time she sang, and they will be hearing her in person soon, for the 150th Anniversary of the arrival of the vessel *Hector* off Nova Scotia is to be celebrated this Summer. July 15 to 22 has been set as the date of the celebration. A replica of the ship has been constructed and will be sailed down the harbor of Pictou, manned by direct descendants of the original Scotch settlers who came in the original *Hector* a hundred and fifty years ago.

From that little ship have sprung many well-known people, and most of them, holding proudly as they do to their Scotch ancestry, will be in Pictou for the celebration. Miss Armstrong will be there, of course, and will sing the old songs. In fact, it is hoped to broadcast some of the meetings, so that people may "attend" by radio throughout the Maritime Provinces.

After the week is over, Miss Armstrong will tour the Maritime Provinces, where a number of concerts have been booked. Those who heard her by radio, and those who have heard of her as a Scotch-Canadian with a beautiful voice, are sure to throng the halls. With the end of Summer she will return to the states, to fill the concert engagements — radio-inspired — and perhaps broadcast a bit too.

Four Stations Transmit Same Program

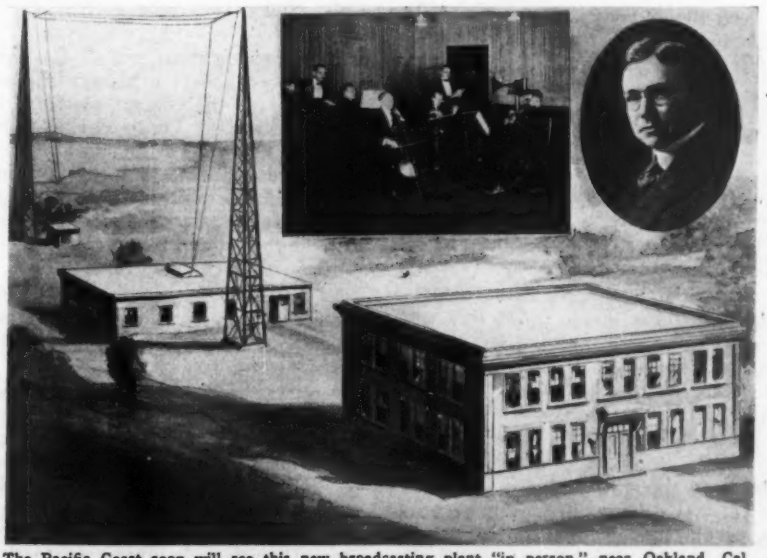
ON June 7 four broadcasting stations, located in as many cities, broadcast simultaneously the same program, the evening meeting of the National Electric Light Association, at Carnegie Hall, New York City. The proceedings were broadcast from WEAF, New York City; WGY, Schenectady, N. Y.; KDKA, Pittsburgh, Pa.; and WMAQ, Chicago, Ill. The program included soprano solos by Anna Case, Metropolitan Opera star, and an address by Julius H. Barnes, president of the Chamber of Commerce of the United States. This was the most extensive simultaneous broadcasting in the history of the art to date, and presages the time when the entire nation, from coast to coast and gulf to lakes, will be able to "attend" any event of national importance occurring at any place within the confines of the country. The feat is accomplished by linking the various transmitters with the hall by means of the long distance telephone wires.

Josephine Vellanti

(*Continued from page 37*)

well, broadcast, I suppose you could call it. Plato, and the sea gulls, and broadcasting of music, my music, all suddenly fitted together, *pouf*, like that!

"What I want to do next is not only to sing for the radio, but try to increase the musical appreciation of the people. So often I notice that when I sing a program that I have spent just weeks and weeks in preparing, the audience just listens, and likes the pretty music, and doesn't get the underlying motive, the message, at all. They



The Pacific Coast soon will see this new broadcasting plant "in person," near Oakland, Cal. Work has started. The inserts in this architect's wash drawing show the new studio, and Martin P. Rice, director of broadcasting for the General Electric Co.

don't see things in a grand sweep. They like the details, but the concert as a whole is apparently too big for them. The motif back of a recital is something they have not learned to grasp, or even look for. I usually have some one theme or idea back of my concerts, but I must say that the audiences don't seem to take it in, and I have talked with other singers who say the same thing.

"New York is the musical center of America, all right, and yet even here there is a big field for education in musical appreciation. H. E. Krehbiel, the famous critic, who died recently, you know, did a great deal in his lecture work, and now that he is gone I don't know who is to take his place. Even he could talk to only a thousand or so people at a time. I don't think he ever broadcast, do you? What a pity, what a pity!

"Out in the Western states it is quite interesting to see how taste differs from the East. I think they are more musical out there, more crazy about it. Especially jazz, of course, but they seem to like almost everything. It seems rather an undiscriminating appreciation. If it's music, they like it, that's all. Now that is something that just calls aloud for someone to give lectures on music by radio.

"One peculiar thing that I noticed in the West was the popularity of 'Lindy Lou.' Both in Kansas City and Chicago I was asked several times to sing it, while I was broadcasting, and I couldn't do it, because I didn't know the song then. It wasn't on my repertoire. I have it now. I bought it when I got home, just for sentiment, you might say, and when I go across the continent again I'll have it ready, if they still want it and haven't turned over to another new favorite."

And that is the picture of a singer who suddenly "discovered" for herself what radio is and can be.

How Age Wonders

(*Continued from page* 42)

Sweet Home.' They make me wish for my old home, wish that I were back. They make me feel sad, a little bit too much, sometimes.

"But it's the Capitol Studio that I like best, those young ladies that sing. I don't quite see how their voices come through the set, I'd like to see where they are singin', and how they look. And Mr. Rothafel—Roxie we call him—he's just wonderful."

Mrs. Cutting gave a little laugh at the very thought.

"He must be a fat man, he's so understandin' and funny. Miss, did you hear my letter when Roxie read it over the wireless?"

Then she told me that on the very Sunday evening that the letter of appreciation was broadcast the door bell rang and a big man stepped in saying that he had heard the letter half an hour before and that he had a great big car right in the neighborhood and any time she was ready to go down to the Capitol he would be delighted to take her. She is counting on the outing some day this Summer. All that is needed now is to be sure there is a wheel chair for her use. And Roxie says that there is.

"Well, miss, have you heard the Night Hawks from Kansas City? And WWJ? They're fine. I think WEAF is my favorite station in the neighborhood. You have a radio too? Well, I guess lots of people have these days. Just think what I've seen in my day! Telephones and automobiles and airplanes and radio! It don't seem in the nature of things.

"It don't take long to get to be 97 years old. Why I've had 10 children, better than they do nowadays, and I've lived to see the fifth generation. And now this music, out of nowheres you might say."

Mrs. Cutting told me a good deal of her family and her forebears. Her maiden name was Lajoie. In English it would be "Joy," and it suits her well. In spite of her infirmity she seems so happy with her pipe, her white dog and her tiger cat, and last but not least the set that gives her the "fiddlin'."

I left with regret. And these were the dear old lady's parting words:

"You come again to see me, and I'd like to make you a quilt."

Patricia Boyle

(*Continued from page* 39)

me that they are giving me exactly the same course that they give to everybody."

Patricia is eighteen, and she has some years of work before her ere she will be ready for the concert platform, as a finished artist. Those who heard her by radio marveled at her sure mastery of the instrument, and the certainty with which she enunciated the messages of the master works that she played. Can she be blind who can illumine music with such vision?

"I do think that if anyone has anything that they want to give to others they should give it by radio," was her parting comment.

And as a final thought, Patricia should be considered as having given a great many of us a great deal by radio—the inspiring thought that vision can be independent of the eye, and that success can come even to one living in darkness, if only inward sight be present. Patricia is holding up a torch to the blind—and to the seeing as well.

Distant Broadcasting Stations Heard

Broadcasting fans daily surprise themselves and others by reaching out across hundreds of miles by a turn of the wrist. Often the most simple bulb equipment will produce astonishing results, as reported below. What have YOU done?

J. HUGH TAYLOR, Washington, D. C., has a single circuit regenerative receiver with two stages of radio frequency amplification, a list of 156 broadcasting stations heard, and great contentment. His list of stations over a thousand miles away is as follows:

CJCG	Winnipeg, Canada	1,650 Miles
KDYS	Great Falls, Mont.	2,300 Miles
KDYW	Phoenix, Ariz.	2,572 Miles
KET	Bolinas, Cal.	2,700 Miles
KFDB	San Francisco, Cal.	2,700 Miles
KFDY	Brookings, S. D.	1,375 Miles
KFI	Los Angeles, Cal.	2,600 Miles
KFZ	Spokane, Wash.	2,665 Miles
KLS	Oakland, Cal.	2,700 Miles
KQY	Portland, Ore.	3,000 Miles
PWX	Havana, Cuba	1,400 Miles
WAAK	Minneapolis, Minn.	1,150 Miles
WAAW	Omaha, Neb.	1,275 Miles
WBAP	Fort Worth, Tex.	1,600 Miles
WCAR	San Antonio, Tex.	1,600 Miles
WCM	Austin, Tex.	1,600 Miles
WDAF	Kansas City, Mo.	1,200 Miles
WDAY	Fargo, N. D.	1,400 Miles
WGAD	Ensenada, P. R.	1,700 Miles
WGAT	Lincoln, Neb.	1,330 Miles
WGF	Des Moines, Ia.	1,145 Miles
WGV	New Orleans, La.	1,100 Miles
WHAB	Galveston, Tex.	1,500 Miles
WHB	Kansas City, Mo.	1,100 Miles
WHX	Des Moines, Ia.	1,100 Miles
WIAZ	Miami, Fla.	1,200 Miles
WKY	Oklahoma City, Okla.	1,400 Miles
WLAG	Minneapolis, Minn.	1,100 Miles
WAMA	Beaumont, Tex.	1,500 Miles
WNAK	Manhattan, Kan.	1,200 Miles
WOAW	Omaha, Neb.	1,200 Miles
WOI	Ames, Ia.	1,100 Miles
WOQ	Kansas City, Mo.	1,100 Miles
WOS	Jefferson City, Mo.	1,000 Miles
WSV	Little Rock, Ark.	1,000 Miles
WYG	San Antonio, Tex.	1,600 Miles

BURDETTE M. SMITH, R. F. D., Le Mars, Ia. writes: "This is an expression of appreciation and gratification at the results that I have obtained with my particular set." Mr. Smith is installing Grebe and Magnavox equipment, including power amplifier, and also radio frequency amplification.

WKAQ	San Juan, P. R.	2,100 Miles
5KW	Tuinucu, Cuba	2,000 Miles
PWX	Havana, Cuba	2,000 Miles
KFI	Los Angeles, Cal.	1,300 Miles
KHJ	Los Angeles, Cal.	1,300 Miles
KWH	Los Angeles, Cal.	1,300 Miles
KPO	San Francisco, Cal.	1,450 Miles
KFDB	San Francisco, Cal.	1,450 Miles
KUO	San Francisco, Cal.	1,450 Miles
KGW	Portland, Ore.	1,300 Miles
WFAE	Pullman, Wash.	1,300 Miles
CFCN	Calgary, Canada	1,000 Miles
CHBC	Calgary, Canada	1,000 Miles
WBZ	Springfield, Mass.	1,250 Miles

GEO. SACKMAN, Buena Vista, Fla., reports hearing 49 stations since Christmas Day, on his single circuit one tube set. He says "they come in clear as a bell." Some Christmas present, eh, Geo.?

KDKA	Pittsburgh, Pa.	1,000 Miles
KHJ	Los Angeles, Cal.	2,500 Miles
KSD	St. Louis, Mo.	1,100 Miles
WBAP	Fort Worth, Tex.	1,200 Miles
WBAY	New York City	1,150 Miles
WDAF	Kansas City, Mo.	1,250 Miles
WDAR	Philadelphia, Pa.	1,000 Miles
WDAP	Chicago, Ill.	1,250 Miles
WEAF	New York City	1,150 Miles
WFAA	Dallas, Tex.	1,200 Miles
WGY	Schenectady, N. Y.	1,250 Miles
WHB	Kansas City, Mo.	1,250 Miles
WJZ	Newark, N. J.	1,150 Miles
WJAX	Cleveland, O.	1,050 Miles
WOO	Philadelphia, Pa.	1,000 Miles
WOR	Newark, N. J.	1,150 Miles
WOC	Davenport, Ia.	1,250 Miles

WILLIAM COEL, Canton, O., using a home-made detector and one step has heard 154 different stations in less than a year. Some of the more distant ones are:

KHJ	Los Angeles, Cal.	2,250 Miles
KFI	Los Angeles, Cal.	2,250 Miles
KWH	Los Angeles, Cal.	2,250 Miles
PWX	Havana, Cuba	1,400 Miles
5KW	Tuinucu, Cuba	1,450 Miles
WKAQ	San Juan, P. R.	1,850 Miles
WOAI	San Antonio, Tex.	1,350 Miles

Laughter on the Radio Wave

Health by Radio

Now that all the hospitals are installing radio sets, and the doctors say that radio has curative powers because it steers the mind in a healthy channel of thought, it is high time that some radio prescriptions were written. The present hodge-podge programs cannot be tolerated any longer. Just think of the effect of broadcasting an address on honesty! All the stock brokers at Muldoon's would be set back at least five minutes in their cure! And what is a sore-footed ex-marathon dancer to do with a jazz band? No no, this has got to stop. Programs must be arranged with a view to the sick. Determined to be always in the lead (whatever the cost) this Whirligig of Whimsicality herewith presents the first medical radio program. The numbers after each disease represent the wave length on which the transmission is done. Cures guaranteed if you can pick up our station.

Insomnia—37 snores

11 p. m., Cradle Song, Brahms.
11:30, Sheep Counting Exercise Baa-baa.
Midnight, Howling Dog Sonata, Bow-wow.

Dyspepsia—1 pain

2 p. m., Luncheon Menu, reading by the Waldorf-Astoria.
2:15, Simple Regrets, bass solo by Tummy Tum.
2:30, Wild Mint and How to Catch It, by Sportsman Jack.
3:10, Swearing, On and Off, by Goshdam.

Hysteria—8 giggles

The following joke will be read every half hour throughout the day and night. It is the one sure cure for hysteria. If you've got the giggles, hold 'em until you hear this. Remember, it is read twice an hour, on the hour and half hour. The only 100 per cent. absolutely sure cure for hysterics:

"What's the difference between a man who went to Niagara Falls, and one who didn't?"

"One seen the mist, and the other missed the scene."

D. T.'s—139 hiccups

8 a.m., Valse Scotch, Revenooer.
Noon, Exercise in double sight, by a clairvoyant.
3:30 p. m., Character reading, from the "Face on the Barroom Floor."
6:19, "How Dry I Am," sung by The Bottle.
9:23, Ten Ways of Falling into Bed, by Sleepitoff the famous Russian tumbler.

Flatfoot—16 stumbles

11:30 a. m., Arches and How I Built Them, by Julius Caeser.
5:11 p. m., How to Walk on Your Hands, by Houdini.
6:48, Why Walk at All? by Henry Ford.

Sore Thumb—1 dammit

8:01 p. m., Song of the Hammer, by the Nail & Iron Quartet.
8:10, How to Find the Witch Hazel in the Dark, by Nature Faker.

Corns—76 limps

10:30 p. m., How to Heat Water, by the kitchen stove.
10:35, Wild Plasters I Have Met, song by the Cozy Toes Double Quartet.
10:45, How to Avoid Corns, reading by Chief Barefoot of the Stonebruise Tribe.

This program will cure the most important ills to which mankind is heir. Those afflicted with rare diseases not treated in the present series of radio prescriptions should buy a radio set and then visit the family doctor. Arrangements have been made with the medical profession whereby special cures will be transmitted, fees to be split fifty-fifty between the doctor, the broadcasting station and the radio druggist.

WHEN A FELLER NEEDS A FRIEND

LADIES AND GENTLEMEN: THIS IS STATION F.G.K. WE WISH TO ANNOUNCE ON BEHALF OF MRS. ETHEL HICKERSON THAT HER LITTLE PET DOG KIMI HAS BEEN LOST, OR STRAYED OR STOLEN. HE HAS A BLACK PATCH OVER RIGHT EYE, BLACK EARS AND BLACK SPOTS ON BODY. - ANY RESID- ENT WHO IS IN HIS UNABLE ABOUTS ETC.

—Briggs in N. Y. Tribune

Wise Crack-les

Novice: "I want to build my own set, please pick me out a good hook-up."

Clerk: "Ever build a set before?"

Novice: "No, never even used one."

Clerk: "Ah! Here's just the hook-up for you. It's never been tried before. You can start out together."

Angry Wife to radio-mad husband: "Are all men fools like you?"

Husband, sadly: "No, some buy their sets instead of trying to build them themselves."

Calling a man a liar over the telephone was the zenith of vicarious courage until it became possible to say, when a man is making a tedious speech over the radio, "Shut up, you big stiff!"—*N. Y. World.*

A headline reads: "1,000,000 persons within 3,000 miles of the city to hear 'The Fool.'" Who, using Radio has not heard him, I ask you?—*Federal Features.*

"Laugh by radio and the world laughs with you," said someone.

The trouble is that you can't hear it. The radio audience has to deliver its laughs by mail.

Those who have been wondering who revived the old-fashioned "flowers of oratory" are advised that they now are grown on radio broadcasting plants.

The Rose Bowl Musicians are giving radio concerts in San Francisco.

"Oh, well," sighed the amateur, "I guess they must be using a Soup Plate transmitter."

Discovered at last—the ideal set. It is an English idea. The tuning coil is wound around a whisky bottle (full) and a crystal (glass) is supplied free.

Any program would sound well through a set such as this.

Cartoonists' Guns Demolish Radio Fans' Follies

PETEY DINK EXPLAINS THE RADIO

By C. A. VOIGHT

— I simply can't understand how it is possible —
— How does it work?
— Well, you see this here horn here and that there box. Well, now a couple hundred miles away at the sending station is something like that only just the opposite —
— Then they get some woman or man or something — don't make any difference whether they're Italian or French or what not and they sing into a horn and it goes out of the box and up a wire to the roof, see?
— Then there's something they call vitamines or kilometers or whatever it is and they grab it and the next minute those wires of ours grab it and down it comes thru the box and —
— Isn't it wonderful — however does it work?
— I'm so stupid about those things — I wish my husband were here he could tell you — he explained it to me the other day, but, I've forgotten — men know so much more about that sort of thing

—South Bend Tribune

THE FIVE FIFTEEN

By SEGAR

We never have any money the day before pay day and we're going to have company to-night
And all we can serve them is coffee and buns
I'll show 'em a good time with my radio — here they are, now
I'm broke, so that'll have to do
Great — ain't it folks?
You said it, Sapho!
I love radio music
Station B-A-M — we will now have a talk on — what to serve the evening guests?
Guess I'll shut it off, it gets tiresome
Chicken sandwiches, lettuce and tomato salad

—N. Y. American

LIFE ON THE RADIO WAVE

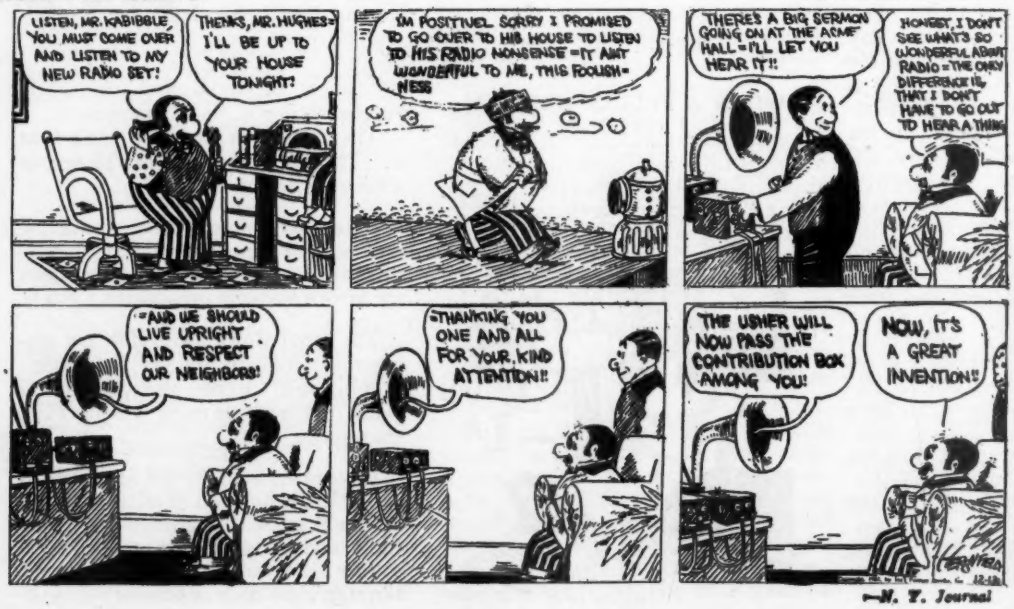
By PINTO

Come on, ol' wiseacre — it's for you! His majesty, th' landlord says th' ol' buzzard upstairs is crabbin' about th' noise — I s'pose that loud-speaker is gratin' on her nerves, too. Come on — don't cringe! Now's your chance to listen-in on a program that ain't advertised! I'll say th' ol' landlord's some broad-caster, too! 'Bout tomorrow we'll be broad-castin' our furniture out in th' street! Don't weep, dane, it's your party — not mine! C'mon! Grab it while it's hot.
Listen nan! Go on — you talk to him! Tell him I'm just testin' th' thing out! Please! You know how t' kid 'im along — Go on, honey I-I-I might lose my temper — then what?!

—San Francisco Chronicle

ABIE THE AGENT

By HERSHFIELD


Listen, Mr. Kabibble, you must come over and listen to my new radio set!
Thanks, Mr. Hughes — I'll be up to your house tonight!
I'm positively sorry I promised to go over to his house to listen to his radio nonsense — it ain't wonderful to me, this foolishness
There's a big sermon going on at the Acme Hall — I'll let you hear it!!
Honest, I don't see what's so wonderful about radio — the only difference is that I don't have to go out to hear a thing
— and we should live upright and respect our neighbors!
— thanking you one and all for your kind attention!!
The usher will now pass the contribution box among you!
Now, it's a great invention!!

—N. Y. Journal

DOWN THE LADDER

And you should've heard what Mrs. Smith said — bla-bla-bla — etc. — —
Station W.J.Z.
Then Mrs. Jones came in — the old cat — bla-jabber — etc. — —
Hey Myrtle, your talking makes me realize what a wonderful thing the radio phone is
Why John, what do you mean?
Well — when I get tired of listening to the radio phone —
I can shut it off
Segar 7-4

Segar in N. Y. News

BROADCASTING STATION DIRECTORY

(Revised to June 20th, 1923)

KAO	Young Men's Christian Association, Denver, Colo.	360
KFI	R. C. Anthony.....Los Angeles, Calif.	469
KFZ	Doerr Mitchell Electric Co.....Spokane, Wash.	283
KGB	Wm. A. Mullins Electric Co....Tacoma, Wash.	360
KGG	Hallock & Watson Radio Service..Portland, Ore.	360
KGO	Northwestern Radio Mfg. Co.....Portland, Ore.	360
KGN	Altadena Radio Laboratory.....Altadena, Calif.	360
KGU	M. A. Muirony.....Honolulu, Hawaii	360
KGW	Oregonian Pub. Co.....Portland, Ore.	492
KGY	St. Martins College.....Lacey, Wash.	258
KHJ	Times Mirror Co.....Los Angeles, Calif.	395
KHQ	Louis Wasmer.....Seattle, Wash.	360
KJR	Northwest Radio Service Co.....Seattle, Wash.	270
KJI	The Radio Shop.....Sunnyvale, Calif.	360
KJQ	C. O. Gould.....Stockton, Calif.	360
KJS	Bible Institute of Los Angeles, Inc., Los Angeles, Calif.	360
KLN	Noggle Electric Works.....Monterey, Calif.	360
KLS	Warner Brothers.....Oakland, Calif.	360
KLX	Tribune Publishing Co.....Oakland, Calif.	360
KLZ	Reynolds Radio Co.....Denver, Colo.	360
KMC	Lindsay-Weatherill & Co.....Reedley, Calif.	360
KMJ	San Joaquin Light & Power Co...Fresno, Calif.	360
KMO	Love Electric Co.....Tacoma, Wash.	360
KNH	T. W. Smith.....Eureka, Calif.	360
KNI	Roswell Public Service Co.....Roswell, N. M.	360
KNN	Bullock's.....Los Angeles, Calif.	360
KNT	Grays Harbor Radio Co.....Aberdeen, Wash.	360
KNV	Radio Supply Co.....Los Angeles, Calif.	360
KNX	Electric Lighting Supply Co...Los Angeles, Calif.	360
KOA	T. M. C. A.....Denver, Colo.	360
KOB	New Mexico College of Agriculture and Mechanical Arts, State College, N. Mex.	360
KOP	Detroit Police Dept.....Detroit, Mich.	286
KOQ	Modesto Evening News.....Modesto, Calif.	360
KPO	Hale Bros.....San Francisco, Calif.	423
KQI	University of California.....Berkeley, Calif.	360
KQP	Apple City Radio Club.....Hood River, Ore.	360
KQV	Doubleday-Hill Electric Co.....Pittsburgh, Pa.	360
KRW	Charles D. Herreld.....San Jose, Calif.	360
KRE	Maxwell Electric Co.....Berkeley, Calif.	360
KSD	Post-Dispatch.....St. Louis, Mo.	546
KSL	The Emporium.....San Francisco, Calif.	360
KTB	Pyeni & Dean Radio Rsch. Lab. Long Beach, Calif.	360
KTW	First Presbyterian Church.....Seattle, Wash.	360
KUO	The Examiner Printing Co...San Francisco, Cal.	360
KUS	City Dye Works & Laundry Co. Los Angeles, Cal.	360
KUY	Coast Radio Co.....Del Monte, Calif.	360
KWG	Portable Wireless Telephone Co...Stockton, Calif.	360
KWH	Los Angeles Examiner.....Los Angeles, Calif.	360
KXD	Herald Publishing Co.....Modesto, Calif.	360
KYQ	Electric Shop.....Honolulu, T. H.	360
KYW	Westinghouse Elec. & Mfg. Co...Chicago, Ill.	345
KZM	Preston, D. Allen.....Oakland, Calif.	360
KZN	The Desert News.....Salt Lake City, Utah	360
KZV	Wenatchee Battery & Motor Co.,Wenatchee, Wash.	360
KDKA	Westinghouse Elec. Mfg. Co.....Pittsburgh, Pa.	360
KDPM	Westinghouse Elec. & Mfg. Co.....Detroit, Mich.	270
KDPT	Southern Electric Co.....San Diego, Calif.	360
KDYL	Telegram Publishing Co....Salt Lake City, Utah	360
KDYM	Savoy Theatre.....San Diego, Calif.	360
KDYQ	Oregon Institute of Technology..Portland, Ore.	360
KDYS	The Tribune, Inc.....Great Falls, Mont.	360
KDYW	Smith, Hughes & Co.....Phoenix, Ariz.	360
KDYX	Star Bulletin Publishing Co....Honolulu, T. H.	360
KDZB	Frank E. Siefert.....Bakersfield, Calif.	360
KDZE	The Rhodes Co.....Seattle, Wash.	360
KDZF	Automobile Club of So. Calif., Los Angeles, Calif.	276
KDZG	Cyrus Peirce & Co.....San Francisco, Calif.	360
KDZI	Electric Supply Co.....Wenatchee, Wash.	360
KDZK	Nevada Machinery & Electric Co....Reno, Nev.	360
KDZB	Pyle & Nichols.....Denver, Colo.	360
KDZR	Bellingham Publishing Co...Bellingham, Wash.	261
KDZT	Seattle Radio Association.....Seattle, Wash.	360
KDZU	Western Radio Corporation.....Denver, Colo.	360
KDZV	Cope & Cornwell Co.....Salt Lake City, Utah	360
KDZX	Glad Tidings Tabernacle....San Francisco, Calif.	360
KFAC	McArthur Brothers Mercantile Co., Phoenix, Ariz.	360
KFAE	State College of Washington.....Pullman, Wash.	360
KFAF	Western Radio Corporation.....Denver, Colo.	360
KFAJ	University of Colorado.....Boulder, Colo.	360
KFAN	Electric Shop.....Moscow, Idaho	360
KFAP	Standard Publishing Co.....Butte, Mont.	360
KFAQ	City of San Jose.....San Jose, Calif.	360
KFAR	O. K. Oisen.....Hollywood, Calif.	360
KFAT	Dr. S. T. Donohue.....Eugene, Ore.	360
KFAU	Independent School District....Boise City, Idaho	360
KFAV	Abbott-Kinney Co.....Venice, Calif.	360
KFAW	The Radio Den, Ashford & Whtie, Santa Anna, Calif.	360
KFAY	W. J. Virgin Milling Co.....Central Point, Ore.	360
KFBB	F. A. Buttrey & Co.....Havre, Mont.	360
KFBC	W. K. Azbill.....San Diego, Calif.	360
KFBD	Clarence V. Welch.....Hanford, Calif.	360
KFBE	Reuben H. Horn.....San Luis Obispo, Calif.	360
KFBK	Kimball-Upson Co.....Sacramento, Calif.	360
KFBL	Leese Bros.....Everett, Wash.	224
KFBS	Chronicle News and Gas & Elec. Supply Co., Trinidad, Colo.	360
KFBU	Bishop N. S. Thomas.....Laramie, Wyo.	360
KFCB	Nielsen Radio Supply Co.....Phoenix, Ariz.	360
KFCD	Salem Elec. Co.....Salem, Ore.	360
KFCF	Frank A. Moore.....Walla Walla, Wash.	360
KFCH	Electric Service Station.....Billings, Mont.	360
KFCK	Colorado Springs Radio Co., Colorado Springs, Colo.	360
KFCL	Los Angeles Union Stock Yds..Los Angeles, Calif.	360
KFCM	Richmond Radio Shop.....Richmond, Calif.	360
KFCP	Ralph W. Flygare.....Ogden, Utah	360
KFCQ	Motor Service Station.....Casper, Wyo.	360
KFCV	Fred Mahaffey, Jr.....Houston, Tex.	360
KFCZ	Western Union College.....Le Mars, Iowa	360
KFDA	Omaha Central High School.....Omaha, Nebr.	360
KFDB	Adler's Music Store.....Baker, Ore.	360
KFDB	Mercantile Trust Co.....San Francisco, Calif.	509
KFDC	Radio Supply Co.....Spokane, Wash.	360
KFDF	St. Michaels Cathedral.....Boise, Idaho	360
KFDH	Wyoming Radio Corp.....Casper, Wyo.	360
KFDJ	University of Arizona.....Tucson, Ariz.	360
	Oregon Agri. College.....Corvallis, Ore.	360
KFDL	Knight-Campbell Music Co.....Denver, Colo.	360
KFDO	H. E. Cutting.....Bozeman, Mont.	248
KFDP	Hawkeye Radio & Supply Co....Des Moines, Ia.	278
KFDR	Bullock's Hardware & Sporting Goods, York, Nebr.	360
KFDU	Nebraska Radio Elec. Co.....Lincoln, Nebr.	360
KFDV	Gilbreth & Stimson.....Fayetteville, Ark.	360
KFDX	First Baptist Church.....Shreveport, La.	360
KFDY	South Dakota State College of Agri. & Mech. Arts, Brookings, S. D.	360
KFDZ	Harry O. Iverson.....Minneapolis, Minn.	360
KFEB	The City of Taft.....Taft, Calif.	360
KFEC	Meier & Frank Co.....Portland, Ore.	360
KFEJ	Guy Dreason.....Tacoma, Wash.	360
KFEL	Winner Radio Corporation.....Denver, Colo.	360
KFEP	Radio Equipment Co.....Denver, Colo.	240
KFEQ	J. L. Scroggin.....Oak, Nebr.	360
KFER	Auto Electric Service Co.....Ft. Dodge, Iowa	231
KFEV	Radio Electric Shop.....Douglas, Wyo.	360
KFEX	Augsburg Seminary.....Minneapolis, Minn.	261
KFEY	Bunker Hill & Sullivan Mining & Const. Co., Kellogg, Idaho	360
KFEZ	American Society of Mech. Engrs...St. Louis, Mo.	360
KFFA	Dr. R. O. Shelton.....San Diego, Calif.	242
KFFB	Jenkins Furniture Co.....Boise, Idaho	240
KFFE	Eastern Oregon Radio Co.....Pendleton, Ore.	360
KFFJ	Jenkins Furniture Co.....Boise, Idaho	360
KFFQ	Dr. E. Smith.....Hillsboro, Oregon	229
KFFP	First Baptist Church.....Moberly, Mo.	275
KFFQ	Markschoefel Motor Co...Colorado Springs, Colo.	360
KFFR	Jim Kirk.....Sparks, Nev.	360
KFFV	Graceland College.....Lamoni, Iowa	360
KFFX	McGraw Co.....Omaha, Nebr.	278
KFFY	Pincus & Murphy, Inc.....Alexandria, La.	275
KFFZ	Al. G. Barnes Amusement Co.....Dallas, Tex.	225
KFGB	Loewenthal Brothers.....Pueblo, Colo.	360
KFGC	Louisiana State University.....Baton Rouge, La.	254
KFGD	Chickasha Radio & Elec. Co. ..Chickasha, Okla.	248
KFGF	Buchanan Stevens & Co.....Mt. Vernon, Wash.	360
KFGH	Leland Stanford, Jr., Univ..Stanford Univ., Colo.	360
KFGJ	National Guards Mo., 138th Inf...St Louis, Mo.	266
KFGL	Arlington Garage.....Arlington, Ore.	234
KFGP	Cheney Radio Co.....Cheney, Kans.	229
KFGQ	Crary Hdw. Co.....Boone, Iowa	226
KFGV	Heidbreder Radio Supply Co.....Utica, Nebr.	224
KFGX	First Presbyterian Church.....Orange, Tex.	250
KFGY	Gjelsaug's Radio Shop.....Baudette, Minn.	224
KFGZ	Emmanuel Missionary Co...Berrien Spgs., Mich.	268
KFHA	Colorado State Normal School..Gunnison, Colo.	360
KFHB	The Rialto Theatre.....Hood River, Oregon	360
KFHD	Utz Electric Co.....St. Joseph, Mo.	226
KFHF	Central Christian Church.....Shreveport, La.	266
KFHH	Ambrose A. McCue.....Neah Bay, Wash.	283
KFHI	Charles V. Dixon.....Wichita, Kans.	224
KFHJ	Fallon Co.....Santa Barbara, Calif.	360
KFHL	Penn College.....Oskaloosa, Iowa	227
KFHP	Radio Bug Products Co.....Fairmont, Nebr.	360
KFHR	Star Electric & Radio Co.....Seattle, Wash.	360
KFIB	Franklin W. Jenkens...St. Louis, Mo.	244
KFIC	Philip Laskowits.....Denver, Colo.	224
KFID	Ross Arbuckles Garage.....Iola, Kans.	246
KFIF	Benson Tech. Student Body.....Portland, Ore.	360
KFIJ	Sidney I. Thoreau.....Platte, S. D.	236
KFIL	Windisch Elec. Farm Equipment Co., Louisburg, Kans.	234
KFIQ	Yakima Valley Radio Broadcasting Association, Yakima, Wash.	224
KFJA	Central Power Co.....Brand Island, Nebr.	244
KFJB	Marshall Elec. Co.....Marshalltown, Iowa	248
KFJD	Weld County Printing & Pub. Co., Greeley, Colo.	236
KFJA	Colorado State Teachers College..Greeley, Colo.	248
KFKA	Denver Park Amusement Co.....Lakeside, Colo.	360
KFLE	National Educational Service.....Denver, Colo.	288
WBL	T. & H. Radio Co.....Anthony, Kans.	360
WBS	May & Co.....Newark, N. J.	360
WBT	Southern Radio Corporation.....Charlotte, N. C.	360
WBU	City of Chicago.....Chicago, Ill.	360
WBZ	Westinghouse Elec. & Mfg. Co., Springfield, Mass.	337
WCE	Findley Electric Co.....Minneapolis, Minn.	360
WCK	Stix-Baer-Fuller.....St Louis, Mo.	360
WCM	University of Texas.....Austin, Texas	360
WCN	Clark University.....Worcester, Mass.	360
WCX	Detroit Free Press.....Detroit, Mich.	517
WDM	Church of the Covenant.....Washington, D. C.	360
WDT	Ship Owners Radio Service, Inc., Premier Grand Piano Corporation.....New York, N. Y.	405
WDZ	James L. Bush.....Tuscola, Ill.	278
WEB	Benwood Co.....St. Louis, Mo.	360
WEH	Midland Refining Co.....Tulsa, Okla.	360
WEV	Hurlburt-Still Electrical Co.....Houston, Tex.	360
WEW	St. Louis University.....St. Louis, Mo.	261
WFI	Strawbridge & Clothier.....Philadelphia, Pa.	395
WFY	Couradio Co.....New Wichita, Kans.	360
WGF	The Register & Tribune.....Des Moines, Iowa	360
WGI	American Radio and Research Corporation, Medford Hillside, Mass.	360
WGL	Thomas F. J. Howlett.....Philadelphia, Pa.	360
WGM	Atlanta Constitution.....Atlanta, Ga.	429
WGR	Federal Tel. & Tel. Co.....Buffalo, N. Y.	319
WGV	Interstate Electric Co.....New Orleans, La.	360
WGY	General Electric Co.....Schenectady, N. Y.	380
WHA	University of Wisconsin.....Madison, Wisc.	360
WHB	Sweeney School Co.....Kansas City, Mo.	411
WHD	West Virginia University...Morgantown, W. Va.	360
WHK	The Radiovox Company.....Cleveland, Ohio	360
WHN	Ridgewood Times Printing & Pub. Co., Ridgewood, N. Y.	360
WHX	Iowa Radio Corporation.....Des Moines, Iowa	360
WIK	K. & L. Electric Co.....McKeesport, Pa.	360
WIL	Continental Electric Supply Co., Washington, D. C.	360
WIP	Gimbel Bros.....Philadelphia, Pa.	509
WIZ	Cino Radio Mfg. Co.....Cincinnati, Ohio	360
WJD	Richard Harris Howe.....Granville, Ohio	229
WJH	White & Boyer Co.....Washington, D. C.	273
WJK	Service Radio Equipment Co.....Toledo, Ohio	360
WJX	DeForest Radio Tel. & Tel. Co., New York, N. Y.	360
WJY	Radio Corp. of America..Aeolian Hall, N. Y. C.	405
WJZ	Radio Corp. of America..Aeolian Hall, N. Y. C.	455
WKA	Landaus Music & Jewelry Co., Wilkes-Barre, Pa.	360
WKC	Joseph M. Zamoiski Co.....Baltimore, Md.	360
WKN	Riechman-Crosby Co.....Memphis, Tenn.	360
WKY	Oklahoma Radio Shop....Oklahoma City, Okla.	360
WLB	University of Minnesota....Minneapolis, Minn.	360
WLH	Hamilton Mfg. Co.....Indianapolis, Ind.	360
WLW	Crosley Mfg. Co.....Cincinnati, Ohio	309
WMA	Arrow Radio Laboratories.....Anderson, Ind.	360
WMC	Commercial .....Memphis, Tenn.	500
WMH	Precision Equipment Co.....Cincinnati, Ohio	248
WMU	Doubleday-Hill Elec. Co.....Pittsburgh, Pa.	261
WNJ	Shotton Radio Mfg. Co.....Albany, N. Y.	400
WNO	Wireless Telephone Co. of Hudson County, N. J., Jersey City, N. J.	360
WOC	Palmer School of Chiropractic....Davenport, Iowa	484
WOI	Iowa State College.....Ames, Iowa	360
WOK	Arkansas Light & Power Co....Pine Bluff, Iowa	360
WOO	John Wanamaker.....Philadelphia, Pa.	509
WOQ	Western Radio Co.....Kansas City, Mo.	360
WOR	L. Bamberger Co.....Newark, N. J.	405
WOS	Missouri State Mktg. Bureau, Jefferson City, Mo.	360
WOU	Metropolitan Utilities District....Omaha, Nebr.	360
WPA	Fort Worth Record.....Fort Worth, Tex.	360
WPG	Nushawg Poultry Farm.....New Lebanon, Ohio	360
WPI	Electric Supply Co.....Clearfield, Pa.	360
WPO	United Equipment Co.....Memphis, Tenn.	360
WQX	Walter A. Kushi.....Chicago, Ill.	360
WRK	Doron Brothers Electric Co.....Hamilton, Ohio	360
WRL	Union College .....Schenectady, N. Y.	360
WRM	University of Illinois.....Urbana, Ill.	360
WRP	Federal Institute of Radio Telegraphy, Camden, N. J.	360
WRR	City of Dallas (Police and Fire Signal Department), Dallas, Tex.	360
WRW	Tarrytown Radio Research Lab..Tarrytown, N. Y.	273
WSB	Atlanta Journal .....Atlanta, Ga.	429
WSL	J. & M. Electric Co.....Utica, N. Y.	360
WSY	Alabama Power Co.....Birmingham, Ala.	360
WSZ	Marshall-Gerken Co.....Toledo, Ohio	360
WTG	Kansas State Agr. College.....Manhattan, Kans.	360
WTP	George M. McBride.....Bay City, Mich.	360
WWB	Daily News Printing Co.....Canton, Ohio	360
WWI	Ford Motor Co.....Dearborn, Mich.	273
WWJ	The Detroit News.....Detroit, Mich.	517
WWL	Loyola University .....New Orleans, La.	360
WWZ	John Wanamaker .....New York, N. Y.	360
WAAB	Valdemar Jensen .....New Orleans, La.	268
WAAC	Tulane University.....New Orleans, La.	360
WAAD	Ohio Mechanics Institute.....Cincinnati, Ohio	360
WAAF	Chicago Daily Drovers Journal.....Chicago, Ill.	286
WAAH	Commonwealth Electric Co.....St. Paul, Minn.	360
WAAK	Gimbel Bros.....Milwaukee, Wis.	360
WAAL	Beamish Electric Co.....Minneapolis, Minn.	360
WAAM	L. R. Nelson Co.....Newark, N. J.	263
WAAN	University of Missouri.....Columbia, Mo.	254
WAAP	Otto W. Taylor.....Wichita, Kans.	360
WAAQ	New England Motor Sales Co., Greenwich, Conn.	360
WAAS	Georgia Radio Co.....Decatur, Ga.	360
WAAW	Omaha Grain Exchange.....Omaha, Nebr.	360
WAAY	Yahrling-Raynor Piano Co....Youngstown, Ohio	360
WAAZ	Hollister-Miller Motor Co.....Emporia, Kans.	360
WABA	Lake Forest College.....Lake Forest, Ill.	286
WABB	Dr. John B. Lawrence.....Harrisburg, Pa.	266
WABC	Fulwider-Grimes Battery Co.....Anderson, Ind.	229
WABD	Parker High School.....Dayton, Ohio	286
WABE	Y. M. C. A.....Washington, D. C.	283
WABF	Mt. Vernon Register-News Co...Mt. Vernon, Ill.	244
WABG	Arnold Edwards Piano Co....Jacksonville, Fla.	248
WABH	Lake Shore Tire Co.....Sandusky, Ohio	240
WABK	First Baptist Church.....Worcester, Mass.	252
WARL	Connecticut Agri. College.....Storrs, Conn.	283
WAJV	Indian Pipe Line Corp.....Princeton, Ind.	360
WBAA	Purdue University .....West Lafayette, Ind.	360
WBAD	Sterling Electric Co. and Journal Printing Co., Minneapolis, Minn.	360
WBAH	The Dayton Co.....Minneapolis, Minn.	360
WBAN	Wireless Phone Corporation.....Paterson, N. J.	244
WBAO	James Millikin University.....Decatur, Ill.	360
WBAP	Wortham-Carter Pub. Co., The Star Telegram, Fort Worth, Tex.	476
WBAU	Republican Publishing Co.....Hamilton, Ohio	258
WBAV	Erner & Hopkins Co.....Columbus, Ohio	360
WBAW	Marietta College .....Marietta, Ohio	360
WBAX	John H. Stenger, Jr.....Wilkes-Barre, Pa.	360
WBAY	Western Electric Co.....New York, N. Y.	492
WBBA	Newark Radio Laboratory.....Newark, Ohio	240
WBBC	Sterling Radio Equipment Co.....Sterling, Ill.	229
WBBD	Barbey Battery Service.....Reading, Pa.	224
WCAB	Newburgh News Printing & Publishing Co., Newburgh, N. Y.	360
WCAD	St. Lawrence University.....Canton, N. Y.	360
WCAE	Kaufman & Baer Co.....Pittsburgh, Pa.	462
WCAF	Michigan Limestone & Chemical Co., Rodgers, Mich.	360
WCAG	Clyde B. Randall.....New Orleans, La.	268
WCAH	Entrekin Electric Co.....Columbus, Ohio	286
WCAJ	Nebraska Wesleyan University, University Pl., Nebr.	360
WCAK	Alfred P. Daniel.....Houston, Tex.	360
WCAL	St. Olaf College.....Northfield, Minn.	360
WCAM	Villanova College.....Villanova, Pa.	360
WCAO	Sanders & Stayman Co.....Baltimore, Md.	360
WCAR	Alamo Radio Electric Co.....San Antonio, Tex.	360
WCAS	William Hood Dunwoody Industrial Institute, Minneapolis, Minn.	360
WCAT	South Dakota School of Mines..Rapid City, S. D.	240
WCAU	Durham & Co.....Philadelphia, Pa.	268
WCAV	J. C. Dies Electric Co.....Little Rock, Ark.	360
WCAX	University of Vermont.....Burlington, Vt.	360
WCAY	Kesselmen O'Driscoll Co.....Milwaukee, Wisc.	360
WCBB	K & K Radio Supply Co.....Greenville, Ohio	240
WDAD	Central Kansas Radio Supply...Lindsborg, Kans.	360
WDAE	Tampa Daily Times.....Tampa, Fla.	360
WDAF	Kansas City Star.....Kansas City, Mo.	411
WDAG	Martin J. Laurence.....Amarillo, Tex.	293
WDAH	Trinity Methodist Church.....El Paso, Tex.	360
WDAI	Hughes Radio Corporation.....Syracuse, N. Y.	246
WDAJ	Atlanta & West Point R. R. Co., College Park, Ga.	360
WDAK	The Courant .....Hartford, Conn.	360
WDAL	Florida Times Union.....Jacksonville, Fla.	360

WDAM	Weston Electric Co.	New York, N. Y. 360
WDAO	Automotive Electric Co.	Dallas, Tex. 360
WDAP	Midwest Radio Central, Inc.	Chicago, Ill. 360
WDAR	Lit Brothers	Philadelphia, Pa. 395
WDAS	Samuel W. Wallis	Worcester, Mass. 360
WDAU	Slocum & Kilburn	New Bedford, Mass. 360
WDAX	First National Bank	Centerville, Iowa 360
WDAY	Fargo Radio Service Co.	Fargo, N. D. 244
WDBC	Kirk Johnson & Co., Inc.	Lancaster, Pa. 258
WEAA	Failain & Lathrop	Flint, Mich. 360
WEAB	Standard Radio Equipment Co.	Fort Dodge, Ia. 360
WEAD	Henry Radio & Elec. Supply	Atwood, Kans. 268
WEAE	Virginia Polytechnic Institute	Blacksburg, Va. 360
WEAF	American Tel. & Tel.	New York, N. Y. 492
WEAG	Nichols Hineline Bassett Laboratory,	Edgewood, R. I. 231
WEAH	Wichita Board of Trade & Landers Radio Co.,	Wichita, Kans. 360
WEAI	Cornell University	Ithaca, N. Y. 286
WEAJ	University of South Dakota	Vermillion, S. D. 360
WEAK	Julius B. Abercombie	St. Joseph, Mo. 360
WEAM	North Plainfield, Borough of N. Plainfield,	North Plainfield, N. J. 252
WEAN	Shepard Company	Providence, R. I. 360
WEAO	Ohio State University	Columbus, Ohio 360
WEAP	Mobile Radio Co., Inc.	Mobile, Ala. 360
WEAR	Baltimore Am. & News Pub. Co.,	Baltimore, Md. 360
WEAS	Hecht Company	Washington, D. C. 360
WEAU	Davidson Brothers Co.	Sioux City, Iowa 360
WEAV	Sheridan Electric Service Co.	Brushville, Nebr. 360
WEAX	T. J. M. Daly	Little Rock, Ark. 360
WEAY	Will Horwitz, Jr.	Houston, Tex. 360
WEAZ	Donald Redmond	Waterloo, Iowa 360
WFAA	A. H. Belo & Co.	Dallas, Tex. 476
WFAB	Carl C. Woese	Syracuse, N. Y. 234
WFAC	Superior Radio Co.	Superior, Mich. 360
WFAF	Henry C. Spratley	Poughkeepsie, N. Y. 273
WFAG	Radio Engineering Laboratory,	Waterford, N. Y. 360
WFAH	Electrical Supply Co.	Port Arthur, Tex. 360
WFAJ	Hi-Grade Wireless Instrument Co.,	Asheville, N. C. 360
WFAM	Times Publishing Co.	St. Cloud, Minn. 360
WFAN	Hutchinson Elec. Service Co.	Hutchinson, Minn. 360
WFAQ	Missouri Wesleyan College & Cameron Radio Co.,	Cameron, Mo. 360
WFAT	Daily Argus Leader	Sioux Falls, S. D. 360
WFAV	University of Nebraska	Lincoln, Nebr. 360
WFAZ	South Carolina Radio Shop	Charleston, S. C. 360
WGAC	Orpheum Radio Stores Co.	Brooklyn, N. Y. 360
WGAD	Spanish Am. Sch. of Telegraphy,	Ensonada, P. R. 360
WGAJ	W. H. Glass	Shenandoah, Iowa 360
WGAL	Lancaster Elec. Supply & Const. Co.,	Lancaster, Pa. 360
WGAM	Orangeburg Radio Equipment Co.,	Orangeburg, S. C. 360
WGAN	Cecil E. Lloyd	Pensacola, Fla. 360
WGAQ	W. G. Patterson	Shreveport, La. 360
WGAR	Southern American	Fort Smith, Ga. 360
WGAU	Marcus G. Limb	Wooster, Ohio 226
WGAW	Ernest C. Albright	Altoona, Pa. 360
WGAX	Radio Electric Co. Washington Courthouse,	Ohio 360
WGAY	North Western Radio Co.	Madison, Wisc. 360
WGAZ	South Bend Tribune	South Bend, Ind. 360
WHAA	State University of Iowa	Iowa City, Iowa 283
WHAB	Clark W. Thompson	Galveston, Tex. 360
WHAC	Cole Brothers Elec. Co.	Waterloo, Iowa 360
WHAD	Marquette University	Milwaukee, Wisc. 360
WHAE	Automotive Electric Service Co.	Sioux City, Ia. 360
WHAG	University of Cincinnati	Cincinnati, Ohio 222
WHAH	J. T. Griffin	Joplin, Mo. 360
WHAK	Roberts Hardware Co.	Clarksburg, W. Va. 360
WHAL	Lansing Capital News	Lansing, Mich. 248
WHAM	School of Music, Rochester Univ.,	Rochester, N. Y. 360
WHAO	F. A. Hill	Savannah, Ga. 360
WHAP	Dewey L. Otta	Decatur, Ill. 360
WHAQ	Semmes Motor Co.	Washington, D. C. 242
WHAS	Courier Journal & Times	Louisville, Ky. 400
WHAV	Wilmington Elec. & Supply Co.,	Wilmington, Del. 360
WHAW	Pierce Electric Co.	Tampa, Fla. 360
WHAX	Huntington Press	Huntington, Ind. 360
WHAZ	Rensselaer Polytechnic Institute	Troy, N. Y. 380
WIAB	Joslyn Automobile Co.	Rochford, Ill. 360
WIAD	Ocean City Yacht Club	Ocean City, N. J. 254
WIAE	Mrs. Robt. E. Zimmerman	Venton, Ia. 360
WIAF	Gustav A. DeCortin	New Orleans, La. 360
WIAH	Continental Radio Mfg. Co.	Newton, Ia. 360
WIAI	Heers Stores Co.	Springfield, Mo. 360
WIAK	Journal Stockman Co.	Omaha, Nebr. 278
WIAP	J. A. Rudy & Sons	Paducah, Ky. 360
WIAQ	Chronicle Publishing Co.	Marion, Ind. 360
WIAS	Burlington Hawkeye-Home Elec. Co.,	Burlington, Ia. 360
WIAT	Leon T. Noel	Tarkio, Mo. 360
WIAU	American Sec. & Sav. Bank	La Mars, Ia. 360
WIAV	New York Radio Laboratories,	Binghamton, N. Y. 360
WIAW	Saginaw Radio & Elec. Co.	Saginaw, Mich. 360
WIAY	Fox River Valley Radio Supply Co.,	Neenah, Wisc. 224
WJAD	Jackson's Radio Eng. Lab.	Waco, Tex. 360
WJAF	Press Pub. Co.	Muncie, Ind. 360
WJAG	Huse Publishing Co.	Norfolk, Nebr. 360
WJAJ	Y. M. C. A.	Dayton, Ohio 360
WJAK	White Radio Laboratory	Stockdale, Ohio 360
WJAM	D. M. Perham	Cedar Rapids, Ia. 360
WJAN	Peoria Star Co.	Peoria, Ill. 280
WJAP	Kelly-Duluth Co.	Duluth, Minn. 360
WJAR	The Outlet Co.	Providence, R. I. 360
WJAS	Capper Publications	Topeka, Kans. 360
WJAT	Kelley-Vawter Jewelry Co.	Marshall, Mo. 360
WJAX	Union Trust Co.	Cleveland, Ohio 390
WJAZ	Chicago Radio Laboratory	Chicago, Ill. 448
WKAA	H. F. Paar & Republican Times,	Cedar Rapids, Ia. 360
WKAC	Star Publishing Co.	Lincoln, Nebr. 360
WKAF	W. S. Radio Supply Co. and Wm. Schack,	Wichita Falls, Tex. 360
WKAH	Planet Radio Co.	West Palm Beach, Fla. 360
WKAK	Okfuskee County News	Okemah, Okla. 360
WKAL	Gray & Gray	Orange, Tex. 360
WKAN	Alabama Radio Mfg. Co.	Montgomery, Ala. 360
WKAP	Dutee Wilcox Flint	Cranston, R. I. 360
WKAQ	Radio Corporation of Porto Rico,	San Juan, P. R. 360
WKAR	Michigan Agri. College	East Lansing, Mich. 360
WKAS	L. E. Lines Music Co.	Springfield, Mo. 360
WKAV	Laconia Radio Club	Laconia, N. H. 360
WKAW	United Battery Service Co.,	Montgomery, Ala. 226
WKAX	Wm. A. MacFarlane	Bridgeport, Conn. 360
WKAY	Brensau College	Janesville, Ga. 360
WLAC	North Carolina State College	Raleigh, N. C. 360
WLAG	Cutting & Washington Radio Corp.,	Minneapolis, Minn. 417
WLAH	Samuel Woodworth	Syracuse, N. Y. 234
WLAJ	Waco Electrical Supply Co.	Waco, Tex. 360
WLAK	Vermont Farm Mach. Co.	Bellows Falls, Vt. 360
WLAL	Tulsa Radio Co.	Tulsa, Okla. 360
WLAQ	Putnam Hardware Co.	Houlton, Me. 360
WLAP	W. V. Jordon	Louisville, Ky. 360
WLAQ	A. E. Schilling	Kalamazoo, Mich. 360
WLAS	Hutchinson Grain Radio Co.	Hutchinson, Kans. 360
WLAT	Radio and Specialty Co.	Burlington, Iowa 360
WLAV	Electric Shop, Inc.	Pensacola, Fla. 360
WLAW	New York Police Dept.	New York, N. Y. 360
WLAX	Greencastle Community Broadcasting Station,	Greencastle, Ind. 231
WLAY	Northern Commercial Co. of Alaska,	Fairbanks, Alaska 360
WLAZ	Hutton & Jones Electric Co.	Warren, Ohio 248
WMAB	Radio Supply Co.	Oklahoma City, Okla. 360
WMAC	F. Edward Page	Fernwood, Cazenovia, N. Y. 360
WMAF	Round Hills Radio Corp.	Dartmouth, Mass. 360
WMAG	Tucker Electric Co.	Liberal, Kans. 360
WMAH	General Supply Co.	Lincoln, Nebr. 254
WMAJ	Drovers Telegram Co.	Kansas City, Mo. 275
WMAK	Norton Laboratories	Lockport, N. Y. 360
WMAL	Trenton Hdw. Co.	Trenton, N. J. 256
WMAM	Beaumont Radio Equipment Co.	Beaumont, Tex. 360
WMAN	Broad Street Baptist Church	Columbus, Ohio 360
WMAP	Utility Battery Service, Inc.	Easton, Ohio 246
WMAQ	Chicago Daily News	Chicago, Ill. 448
WMAR	Waterloo Electrical Supply Co.	Waterloo, Iowa 360
WMAT	Paramount Radio Corporation	Duluth, Minn. 360
WMAV	Alabama Polytechnic Institute	Auburn, Ala. 250
WMAW	Wahpeton Elec. Co.	Wahpeton, N. D. 360
WMAX	K. & K. Radio Supply Co.	Ann Arbor, Mich. 360
WMAY	Kingshighway Presby. Church	St. Louis, Mo. 360
WMAZ	Mercer University	Macon, Ga. 268
WNAB	Park City Daily News	Bowling Green, Ky. 360
WNAC	Shepard Stores	Boston, Mass. 360
WNAD	Oklahoma Radio Eng. Co.	Norman, Okla. 360
WNAL	R. J. Rockwell	Omaha, Nebr. 360
WNAM	Ideal Apparatus Co.	Evansville, Ind. 360
WNAN	Syracuse Radio Telephone Co.	Syracuse, N. Y. 360
WNAP	Wittenberg College	Springfield, Ohio 360
WNAQ	Charleston Radio Elec. Co.	Charleston, S. C. 360
WNAR	C. C. Rhodes	Butler, Mo. 360
WNAS	Texas Radio Corporation and Austin American Statesman,	Austin, Tex. 360
WNAT	Lenning Bros. Co.	Philadelphia, Pa. 360
WNAW	Henry Kunzmann	Fortress Monroe, Va. 360
WNAX	Dakota Radio Apparatus Co.	Yankton, S. D. 244
WNAY	Ship Owners' Radio Service	Baltimore, Md. 360
WOAA	Dr. Walter Hardy	Ardmore, Okla. 360
WOAB	Valley Radio	Grand Forks, N. D. 360
WOAC	Maus Radio Co.	Lima, Ohio 266
WOAD	Friday Battery & Elec. Co.	Sigourney, Iowa 360
WOAE	Midland College	Fremont, Nebr. 360
WOAF	Tyler Commercial College	Tyler, Tex. 360
WOAG	Apollo Theatre	Belvidere, Ill. 360
WOAH	Palmetto Radio Corp.	Charleston, S. C. 360
WOAI	Southern Equipment Co.	San Antonio, Tex. 360
WOAJ	Ervin's Electrical Co.	Parsons, Kans. 360
WOAK	Collins Hardware Co.	Frankfort, Ky. 360
WOAL	Wm. E. Woods	Webster Groves, Mo. 360
WOAN	James D. Vaughan	Lawrenceburg, Tenn. 360
WOAP	Kalamazoo College	Kalamazoo, Mich. 360
WOAR	Henry P. Lundskow	Kenosha, Wisc. 360
WOAS	Bailey's Radio Shop	Middletown, Conn. 360
WOAT	Boyd Martell Hamp	Wilmington, Del. 360
WOAU	Snowder Boiling Piano Co.	Evansville, Ind. 360
WOAV	Pennsylvania National Guard	Erie, Pa. 360
WOAW	Woodmen of the World	Omaha, Nebr. 360
WOAX	Franklyn J. Wolff	Trenton, N. J. 360
WOAZ	Penick Hughes Co.	Stanford, Texas 360
WPAB	Pennsylvania State College	State College, Pa. 360
WPAC	Donaldson Radio Co.	Okmulgee, Okla. 360
WPAD	Wieboldt & Co.	Chicago, Ill. 360
WPAF	Peterson's Radio Co.	Council Bluffs, Iowa 360
WPAG	Central Radio Co., Inc.	Independence, Mo. 360
WPAH	Wisconsin Dept. of Markets	Waupaca, Wisc. 360
WPAJ	Doolittle Radio Corporation	New Haven, Conn. 360
WPAK	No. Dakota Agricultural College	Fargo, N. D. 360
WPAL	Superior Radio & Telephone Co.,	Columbus, Ohio 360
WPAM	Awerbach & Guettel	Topeka, Kans. 360
WPAP	Theodore D. Phillips	Winchester, Ky. 360
WPAQ	General Sales & Eng. Co.	Frostburg, Md. 360
WPAR	R. A. Ward	Beloit, Kans. 360
WPAS	J. & M. Electric Co.	Amsterdam, N. Y. 360
WPAT	St. Patrick's Cathedral	El Paso, Texas 360
WPAU	Concordia College	Moorhead, Minn. 360
WPAY	Bangor Radio Laboratory	Bangor, Me. 360
WPAZ	John R. Koch	Charleston, West Va. 275
WQAA	Horace A. Beale, Jr.	Parkersburg, Pa. 360
WQAB	Southwest Missouri State Teachers College,	Springfield, Mo. 226
WQAC	E. B. Gish	Amarillo, Tex. 360
WQAD	Whitehall Electric Co.	Waterbury, Conn. 360
WQAE	Moore Radio News Station	Springfield, Vt. 360
WQAF	Sandusky Register	Sandusky, Ohio 360
WQAH	Brock Anderson Elec. Eng. Co.	Lexington, Ky. 256
WQAJ	Ann Arbor Times-News	Ann Arbor, Mich. 360
WQAK	Appel-Higley Electric Co.	Dubuque, Iowa 360
WQAL	Cole County Tel. and Tel. Co.	Mattoon, Ill. 360
WQAM	Electrical Equipment Co.	Miami, Fla. 360
WQAN	Scranton Times	Scranton, Pa. 360
WQAO	Calvary Baptist Church	New York, N. Y. 360
WQAQ	West Texas Radio Co.	Abilene, Tex. 360
WQAS	Prince Walter Co.	Lowell, Mass. 360
WQAT	Radio Equipment Corporation	Westhampton, Va. 360
WQAV	Huntington & Guerry, Inc.	Greenville, S. C. 360
WQAW	Catholic University	Washington, D. C. 360
WQAX	Radio Equipment Co.	Peoria, Ill. 360
WQAY	Gaston Music & Furniture Co.	Hastings, Nebr. 360
WQAZ	Greensboro Daily News	Greensboro, N. C. 360
WRAA	Rice Institute	Houston, Tex. 360
WRAB	Savannah Board of Public Education,	Savannah, Ga. 360
WRAC	State Normal School	Mayville, N. D. 360
WRAD	Taylor Radio Shop	Marion, Kans. 360
WRAF	Radio Club, Inc.	Laporte, Ind. 226
WRAH	Stanley N. Read	Providence, R. I. 360
WRAK	Economy Light Co.	Escanaba, Mich. 360
WRAL	Northern States Power Co. St. Croix Falls,	Wisc. 360
WRAM	Lombard College	Galesburg, Ill. 360
WRAN	Black Hawk Electrical Co.	Waterloo, Iowa 229
WRAO	Radio Service Co.	St. Louis, Mo. 360
WRAP	Winter Park Elec. Construction Co.,	Winter Park, Fla. 360
WRAR	Jacob C. Thomas	David City, Nebr. 360
WRAS	Radio Supply Co.	McLeansboro, Ill. 360
WRAU	Amarillo Daily News	Amarillo, Tex. 360
WRAV	Antioch College	Yellow Spring, Ohio 360
WRAY	Radio Sales Corporation	Scranton, Pa. 360
WRAZ	Rensselaer Polytechnic Institute	Troy, N. Y. 380
WSAA	B. S. Sprague Elec. Co.	Marietta, Ohio 360
WSAB	Southeast Mo. State College,	Cape Girardeau, Mo. 360
WSAC	Clemson Agri. College	Clemson College, S. C. 360
WSAD	J. A. Foster Co.	Providence, R. I. 360
WSAH	A. G. Leonard, Jr.	Chicago, Ill. 360
WSAI	U. S. Playing Card Co.	Cincinnati, Ohio 360
WSAJ	Grove City College	Grove City, Pa. 360
WSAL	Franklin Electrical Co.	Brookville, Ind. 360
WSAN	Seventh Day Adventist Church	New York, N. Y. 360
WSAT	Plainview Electric Co.	Plainview, Tex. 360
WSAV	Clifford W. Vick, Radio Construction Co.,	Houston, Tex. 360
WTAC	Penn Traffic Co.	Johnstown, Pa. 360
WTAG	Kern Music Co.	Providence, R. I. 258
WTAK	Swan-Bower Co.	Steubenville, Ohio 360
WTAS	Charles H. Erbstein	Elgin, Ill. 273
WTAU	Ruegg Battery & Elec. Co.	Tecumseh, Nebr. 360
WTAW	Agricultural & Mechanical College of Texas,	College Station, Tex. 360
WWAC	Sanger Brothers	Waco, Tex. 360
WWAD	Wright & Wright, Inc.	Philadelphia, Pa. 360
WWAH	General Supply Co.	Lincoln, Nebr. 360
WWAX	Worman Brothers	Laredo, Tex. 360
WWAY	Marigold Gardens	Chicago, Ill. 360

Canadian Broadcasting Stations

CFAC	Radio Corporation of Calgary, Ltd.	Calgary, Alberta
CFCA	Star Publishing and Printing Co.,	Toronto, Ontario
CFCB	Marconi Wireless Telegraph of Canada, Ltd.,	Vancouver, B. C.
CFCD	Canadian Westinghouse Co., Ltd.,	Winnipeg, Manitoba
CFCE	Marconi Wireless Telegraph Co. of Canada,	Halifax, Nova Scotia
CFCF	Marconi Wireless Telegraph Co. of Canada, Ltd.,	Montreal, Quebec
CFCH	Abitibi Power and Paper Co., Ltd.,	Iroquois Falls, Ontario
CFCI	Motor Products Corporation	Walkerville, Ontario
CFCN	W. W. Grant Radio, Ltd.	Calgary, Alberta
CFCX	The London Advertiser Co.	London, Ontario
CFPC	International Radio Development Co.,	Fort Frances, Ontario
CFTC	The Bell Telephone Co. of Canada	Toronto, Ontario
CFUC	University of Montreal	Montreal, Quebec
CFVC	Roy Russell Brown	Courtenay, British Columbia
CFYC	Victor Wentworth Odlum	Vancouver, B. C.
CFZC	Canadian Westinghouse Co., Ltd.	Montreal, Quebec
CHAC	Radio Engineers, Ltd.	Halifax, Nova Scotia
CHBC	The Albertan Publishing Co.	Calgary, Alberta
CHCA	Radio Corporation of Vancouver, Ltd.,	Vancouver, B. C.
CHCB	Marconi Wireless Telegraph Co. of Canada, Ltd.,	Toronto, Ontario
CHCC	Canadian Westinghouse Co., Ltd.,	Edmonton, Alberta
CHCF	Radio Corporation of Winnipeg, Ltd.,	Winnipeg, Manitoba
CHCQ	The Western Radio Co., Ltd.	Calgary, Alberta
CHCS	London Radio Shoppe	London, Ontario
CHCB	B. L. Silver	Montreal, Quebec
CHCZ	The Globe Printing Co.	Toronto, Ontario
CHFC	John Millen & Sons, Ltd.	Toronto, Ontario
CHIC	Canadian Westinghouse Co., Ltd.,	Hamilton, Ontario
CHOC	Canadian Westinghouse Co., Ltd.,	Vanvouver, B. C.
CHVC	Metropolitan Motors, Ltd.	Toronto, Ontario
CHXC	J. R. Booth, Jr.	Ottawa, Ontario
CHYC	Northern Electric Co.	Montreal, Quebec
CJBC	Dupuis Freres	Montreal, Quebec
CJCA	The Edmonton Journal, Ltd.	Edmonton, Alberta
CJCB	James Gordon Bennett	Nelson, British Columbia
CJCD	T. Eaton Co., Ltd.	Toronto, Ontario
CJCE	Vancouver Sun Radiotelephones, Ltd.,	Vancouver, B. C.
CJCF	News Record, Ltd.	Kitchener, Ontario
CJCG	Manitoba Free Press Co., Ltd.	Winnipeg, Manitoba
CJCH	The United Farmers of Ontario	Toronto, Ontario
CJCI	McLean, Holt & Co., Ltd.	St. John, New Brunswick
CJCN	Simons Agnew & Co.	Toronto, Ontario
CJCS	Eastern Telephone and Telegraph Co., Ltd.,	Halifax, Nova Scotia
CJCY	Edmund Taylor	Calgary, Alberta
CJGC	London Free Press Printing Co., Ltd.	London, Ontario
CJNC	Tribune Newspaper Co., Ltd.	Winnipeg, Manitoba
CJSC	The Evening Telegram	Toronto, Ontario
CKAC	La Presse Publishing Co.	Montreal, Quebec
CKCB	T. Eaton Co., Ltd.	Winnipeg, Manitoba
CKCD	Vancouver Daily Province	Vancouver, B. C.
CKCE	Canadian Independent Telephone Co., Ltd.,	Toronto, Ontario
CKCK	Leader Publishing Co., Ltd., of Regina,	Regina, Saskatchewan
CKCR	Jones Electric Radio Co.,	St. John, New Brunswick
CKCS	The Bell Telephone Co. of Canada	Montreal, Quebec
CKCZ	Canadian Westinghouse Co., Ltd.	Toronto, Ontario
CKKC	Radio Equipment and Supply Co.	Toronto, Ontario
CKOC	The Wentworth Radio Supply Co.	Hamilton, Ontario
CKQC	Radio Supply Co. of London	London, Ontario
CKZC	Salton Radio Engineering Co.	Winnipeg, Manitoba

WORLD WIDE WIRELESS

Awards to Wireless Operators

THE three Marconi operators of the S.S. *City of Valencia* have each been presented by the German Government and the Hamburg-America line with a pair of Zeiss prism binoculars, suitably inscribed, as a mark of appreciation of the services rendered by wireless at the foundering of the Hamburg-America liner *Hammonia*. The *Hammonia* was lost off the Spanish coast in September last. In response to her distress call several ships, among which was the *City of Valencia*, hurried to her assistance, and the 800 passengers and crew were rescued.

But for the aid of wireless in obtaining assistance, and in directing operations after the assistance had arrived, these lives would not have been saved, and it is noteworthy that when making its various awards to those assisting in this rescue at sea, the Hamburg-America line especially requested the names of all the Marconi operators, thereby showing how highly they appreciate the value of wireless on such an occasion. The wireless department was the only one in which every member was recognized.

Radio at Goteborg Fair

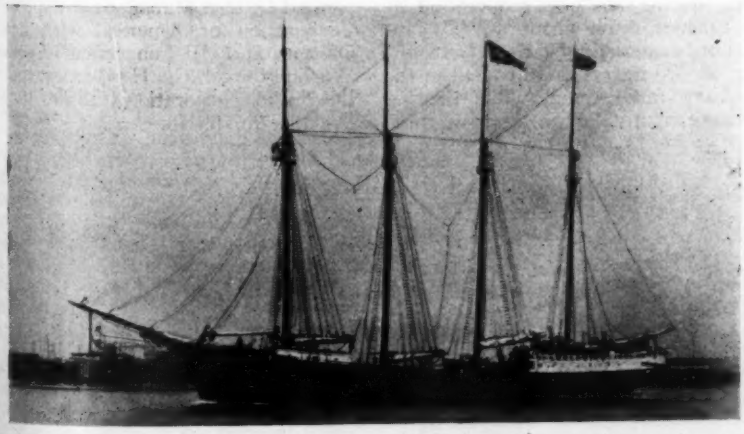
RADIO will have an important place in the International Aero Exhibition at Goteborg, Sweden, during July and August, according to dispatches from Consul Sholes to the U. S. Department of Commerce. A special radio section is under preparation, and several foreign and American firms are expected to exhibit apparatus, especially radio sets suitable for interplane and plane-to-ground communication. A feature of unusual interest will be the daily receipt of news by radio from the United States for the American visitors at the exposition. Through the co-operation of a Swedish-American News Association and the Naval Communication Service, NAA, at Washington, D. C., will broadcast daily five hundred words of "home news."

New Belgian Station

PRELIMINARY work has commenced on the powerful radio telegraph station in Belgium that is being built at Ruysselede, near Bruges. A workshop has been established on the site and machines and material are being put together. It is estimated that two years will be required for the erection of this station, which will be used for direct communication with the United States and with the Belgian Congo.

Broadcasting on the Lakes

RADIO broadcasting service for ships on the Great Lakes began on May 1st, under the direction of the U. S. Hydrographic office. Information as to changes in lights, buoys and signals, and as to menaces to navigation is being broadcast, as well as weather forecasts. The service already has stimulated the installation of receiving sets on lake vessels, which heretofore had not been large users of radio apparatus.



Radio will keep the Schooner "Arctic" in touch with the world during its summer cruise in the Arctic Ocean, in search of furs. With wireless protection the vessel now dares to go farther north than any other trader

Radio Aids Fur Trader

THE schooner *Arctic*, owned by H. Liebes & Company of San Francisco, left that port on May 12th, on a very unusual voyage. The *Arctic* is a fur-trader, and, safeguarded by radio, plans to go this year farther into the Arctic than any trading vessel has heretofore gone. Her final destination will be in the neighborhood of 1,500 miles east of Point Barrow. The *Arctic* is 173 feet long, 37½ feet beam, and draws 14 feet of water. The gross tonnage is 642, net tonnage 418. She is a four-master.

After being purchased by H. Liebes & Co., the vessel was thoroughly reinforced to resist the pressure of the ice. She has a six-cylinder, 350-horsepower Atlas reversible Diesel engine, of the mechanical injection type, and her ordinary speed will be approximately seven knots per hour.

In order to maintain communication with the ship, the Liebes company contracted with the Radio Corporation of America for the installation of a 2-kilowatt 500-cycle spark set, which was installed before the vessel sailed. It is hoped that she will be kept in communication with San Francisco at least during the greater part of the voyage, and no effort was spared in order that this result might be accomplished.

V. Munhollan, a man with considerable experience in the Radio Corporation service, was assigned as operator. He will, no doubt, have a very interesting experience and the results that he obtains in the far north will be closely watched by everyone interested in radio communication.

Radio Exports Increase

DURING the first three months of 1923, the value of exports of American-made radio and wireless apparatus exceeded a half million dollars. An increase of over $30,000 a month since the first of the year, is shown by figures issued by the Department of Commerce. In January, these exports were valued at $141,577; in February the value increased to $173,909, and in March the figure was $213,094. Of the March exports, $70,273 worth went to Quebec and Ontario, $37,030 was purchased in Cuba, and $25,068 worth was shipped to Mexico. The weight of the shipments was approximately 58 tons.

Medical Aid by Wireless

A RECENT example of the life-saving work of wireless medical aid is the case of the S.S. *Rion,* bound from Philadelphia to Rouen. One of the firemen was taken ill with appendicitis. The Marconi operator was instructed to make a general call for medical assistance. This was answered by the S.S. *Ruahine* of the New Zealand Shipping Co., and instructions as to treatment were sent by the doctor. The *Ruahine* however was bound westward and as the distance between the two ships rapidly increased the *Rion* got out of range of the *Ruahine's* wireless signals. It was then necessary for the Marconi operator to establish communication with another ship carrying a doctor, and when the American S.S. *President Adams* came into wireless range further messages were exchanged concerning treatment. Unfortunately drugs recommended by the doctor were not included in the *Rion's* medicine chest. The American captain offered to take the patient aboard but owing to the gale which was raging the *Rion* was unable to steer in the direction necessary to meet the other vessel. Wireless communication was maintained for two days after which time the sick man was landed at Plymouth.

Another recent case was in connection with the American S.S. *Eastern King.* On January 10th, when 1,700 miles west of the French coast, an accident occurred and one of the seamen was injured internally. There was no doctor on board and the patient suffered intensely. The "QST" message was sent out asking for a ship, with a doctor, bound for New York. This was answered by the Italian steamship *Conte Rosso* which was 300 miles to the eastward. Steaming directly toward each other the two ships were due to meet at midnight. Owing to the heavy sea running the captains mutually decided that it was unsafe to attempt to transfer the injured man at that time, so the course of the *Eastern King* was so arranged that the ships would meet at 7 a. m. In the morning there was a dense fog, but the *Conte Rosso* was equipped with a Marconi direction finder, and by its use the ships were able to find each other without delay. They met at 6:45 a. m. when the sick man was transferred to the doctor's care and eventually landed at New York.

Wireless Aids Fishermen

THE fitting of English fishing vessels with wireless apparatus by the Marconi company as recently reported, is proving of considerable value to owners from a commercial point of view, and the utility of the installation in another direction has been demonstrated in connection with the rescue of the crew of a sailing vessel by one of the trawlers recently fitted with wireless. This trawler, the *Harlech Castle,* owned by the Consolidated Steam Fishing and Ice Co., Ltd., of Swansea, rescued the crew of a sailing vessel, the *Foam,* just before that vessel sank. By means of its wireless equipment the *Harlech Castle* informed the owners of the incident and the rescued crew were enabled to advise their relatives of their safety and so allay their anxiety.

U. S. Navy Abandons Spark

IN accordance with the recommendation of the Radio Division of the United States Bureau of Engineering, the United States Navy, both afloat and ashore, is abandoning its spark transmitting sets in favor of vacuum tube transmitters. Extensive tests were made, and formed a basis for the decision to abandon spark transmission. One test, between the 100 kw. spark set at NAA and a 6 kw. tube transmitter, demonstrated the superiority of the latter. Naval stations at San Juan, New Orleans, Balboa, San Diego, and ships in the Atlantic and Pacific, all advised that the CW signals were read more easily and with greater audibility than were the spark signals. The CW transmitter showed some harmonics during the test, but it is expected that these can be eliminated. Another test was between the 6 kw. tube set and a 30 kw. arc at NAA and again the tubes showed their superiority. For the present, however, tube transmitters are being supplied only to the new Navy stations. The program is to discard the spark set first, the arc transmitters next, and finally operate entirely on CW.

Highly gratifying results have been secured with a new model high-power tube transmitter installed on the battleship *Wyoming,* and now used in regular traffic. "In fact," states a Naval report, "some results were unexpected, such as ability to receive on the same vessel during full power operation of this tube set, rating about 5KW." Numerous broadcasting stations transmitting on 400 meters were copied in the auxiliary radio room, while the big transmitter, installed in the main radio room, was supplying 36 amperes to the main antenna on a wave length of 507 meters. The receiving set in the auxiliary room was equipped with an amplifier consisting of three stages of radio-frequency and two stages of audio-frequency. "This condition allows duplex communication, which has actually been put in practice on the *Wyoming* and will be further developed on the *Colorado* and *West Virginia,*" the report states.

The arrangement of the radio rooms on these two battleships will differ from present Naval practice. Receiving will be done in the main receiving room forward, and transmission will be carried on aft from the main transmitting room.

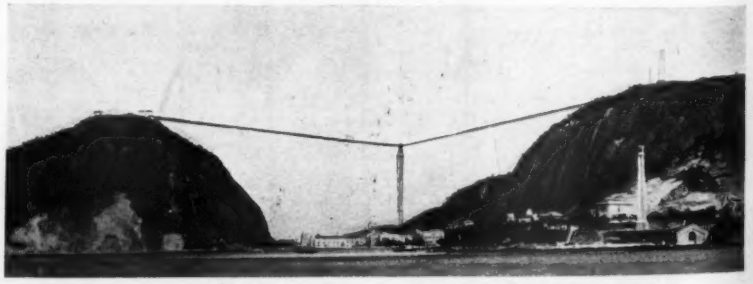
In Naval Aviation Squadrons new tube sets are also replacing spark sets. Five new aerial spotting sets have passed satisfactory tests and are en route to the Air Squadrons of the battle fleet, where they will replace the SE 1345 sets now in use. Spark sets will be used only at Pensacola for training Naval radio personnel.

Modern Equipment of the "Belgenland"

THE new Red Star liner *Belgenland,* which is now sailing in the trans-Atlantic service, is the latest of the great liners to be fitted with the most modern radio apparatus. The equipment was furnished by the Marconi International Marine Communications Co., Ltd., of London, and is powerful enough to keep the ship in constant touch with both sides of the ocean throughout her voyage. In addition to the ordinary transmitting and receiving apparatus, there is a complete Marconi direction finding installation.

F. P. Guthrie Now With R. C. A.

F. P. GUTHRIE, formerly head of the radio division of the United States Shipping Board, has been appointed District Manager for the Radio Corporation of America, with headquarters at 1110 Connecticut Avenue, Washington, D. C. He is in charge of the Radio Corporation's affairs in the Washington territory.



Rio de Janeiro's famous mountains offer all sort of opportunities for antennas, and the Brazilians have been quick to utilize them. Here is the antenna of SPE, suspended vertically from a cable slung between two mountain tops, Urca and Babylonio

Radio on the Riviera

Translated from Radioélectricité

Left, the main building at the Cagnes station, with the antenna lead-in just visible above it. Right, general view of the city and bay taken from the top of one of the radio towers

WHEN the Riviera Express approaches the station of Cagnes, after having passed Antibes, the traveler who looks toward the sea perceives two great masts towering in the air. They emerge from the sandy shore, strike above the luxuriant vegetation and silhouette themselves against the azure sky. Several wires stretch between these masts and several other wires dropping downward may be seen as the train picks up its speed and passes this city, to which in 1911 was transferred the radio telegraph station originally installed at Porquerolles Island.

Visitors to this region know the delights of life there. The great numbers of excursionists and tourists who go there testify to the great charm of the little city of Cagnes. Perched on the summit of a tiny hill, with white and shining houses, Cagnes preserves the memory of its Latin origin. Quite close to the city, and seemingly placed as a sentinel on the shore of the blue sea, the radio station maintains its antenna.

This station is constructed of the conglomerate that is to be found on the shore of the Mediterranean, a stone that is easily quarried and worked, and consists of small pebbles and shells cemented together by the force of nature. This is the typical building material of the region.

The station is, from the point of view of the authorities, located not at Cagnes, but at Cros-de-Cagnes, and it is used for radio telegraph communication between France and Corsica. Recently a radio telephone installation has been added to the original equipment. The antenna is a double "T" supported by two metallic masts each 47 meters (142 feet) high. It has a capacity of about .002 mfd. and a fundamental wave length of 600 meters.

Two transmitters are provided, one a 3-kw. spark set, which is used as an emergency outfit, and the other a 600-watt vacuum tube transmitter.

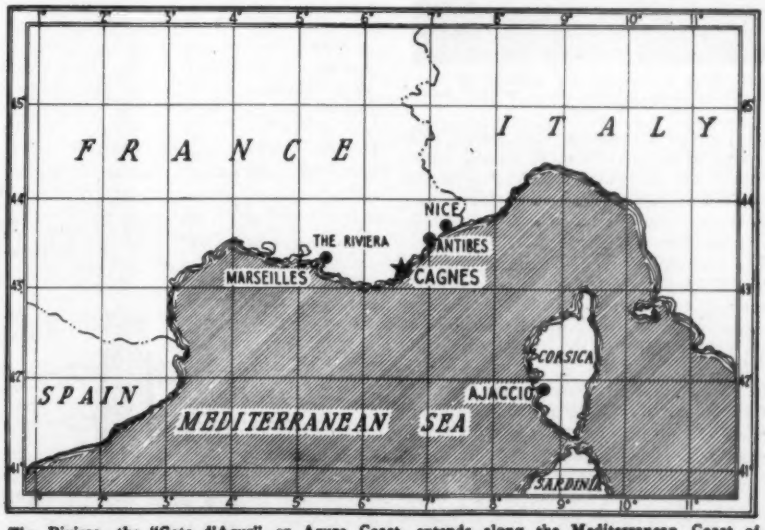
The ground floor of the principal building is divided into three rooms, one containing the storage batteries, another the 3-kw. Marconi spark transmitter, and the third the motor-generators. There are three rooms likewise on the floor above, one of them used for receiving and transmitting, another as an office, and the third as a telegraph room, to which are connected the wires of the French telegraph and telephone systems. The telegraph and telephone lines run to the central bureau at Nice, and there is also a telephone line to Cagnes.

In addition to working with Corsica, the favorable location of this station permits it to work as well with the ships in the Mediterranean, although this service now is only of a secondary nature.

It has been the fortune of the Mediterranean to have erected upon its shores a multiplicity of radio stations whose construction has been dictated by the desires of governmental offices rather than by actual necessity. Their number has passed reasonable limits, and one can say that in many cases service through a Mediterranean station is liable to delay on account of interference, unless the transmitter happens to be one of the few stations of large size.

Placed as it is between the two large parts of Marseilles and Genoa, the Cros-de-Cagnes station has met the same fate as that at Nice and has taken a secondary place among the shore stations, as far as marine traffic is concerned.

Before being turned over to the Corsican service this station had devoted practically its entire attention to working with the French ships trading with Corsica and with the Spanish boats sailing between Barcelona and Genoa. The ships of the other navigation lines, served by the large steamers, came within the range of this station for only a relatively short time. However, it sometimes happened that when the Mediterranean air was clouded by interference, the assistance of the Cros-de-Cagnes station was requested by other transmitters along the shore. Because of its excellent geographical position this station has been able to do some excellent work in receiving



The Riviera, the "Cote d'Azur" or Azure Coast, extends along the Mediterranean Coast of France from the Italian border to about Marseilles

from ships in the Gulf of Lyons. Often it has happened that this station was the only one that was able to hear through interference, the distress calls of ships in the neighborhood of Porquerolles Island. Service of that nature suffices to justify the continuance of the station as a ship-to-shore installation. Its Corsican traffic was in some respects an after-thought, following tests that demonstrated that it was capable of supplementing its activity by working in the new field.

The first of these tests took place toward the end of December, 1920, when the cable between Antibes and Saint Florent, the latter in Corsica, the under-sea link in the telegraph service between Marseilles and Bastia, became broken. Communication by radio telegraph was established between the stations of Cros-de-Cagnes and Ajaccio-Aspretto.

The volume of traffic that was handled by the new route made it plain that the Cros-de-Cagnes station could play an important rôle if provided with suitable technical equipment.

On July 16, 1921, the Corsican cables again were in difficulties and again the Cros-de-Cagnes station was able to transmit between 400 and 500 telegrams a day with its 3-kw. set. The volume of traffic exchanged by cable between Corsica and France averaged about 500 messages a day in each direction.

One quickly saw that the installation of a duplex radio telegraph net between Corsica and France would make it possible for radio to handle the entire load of the cables.

Steps were quickly taken to assure by radio, permanent communication between France and Corsica. A vacuum tube transmitter of suitable power was installed. This is now in operation and gives new importance to a station that originally was designed purely for marine work within a comparatively short radius in the Mediterranean Sea.

"This Is the Life"

By Edward T. Jones. I. R. E.

Here's what Mr. Hart says about broadcasting:

In the very near future it will be realized that radio broadcasting has proven itself to be a potential element in educational systems.

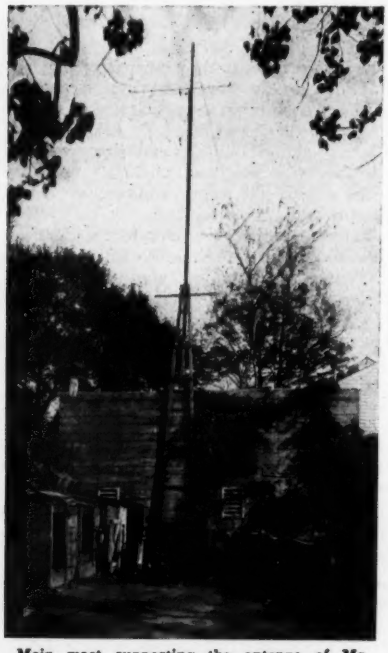
Radio broadcasting offers entertainment of the highest order to both the rich and the poor alike. This will naturally result in bringing to light many musical geniuses.

The bed-ridden, sick and temporarily confined patients will find great solace from the radio telephone receiver installed in hospitals or their homes.

Radio has a strong appeal to young boys. It keeps them home at night, improves their mentality and increases their power of imagination.

It makes the home a better and more interesting place in which to live.

WHEN Mike S. Hart gets home after a busy day at the New Orleans Cotton Exchange, he forgets all about cotton and proceeds to enjoy the programs of the broadcasting stations of his part of the country. It is the great flexibility of the radio installation such as Mr. Hart owns and operates, that places radio receiving apparatus foremost among entertainment and educational devices of similar nature. Every broadcasting station of any consequence has been picked up at Mr. Hart's residence.



Main mast supporting the antenna of Mr. Hart's receiving station down in Ol' New Orleans

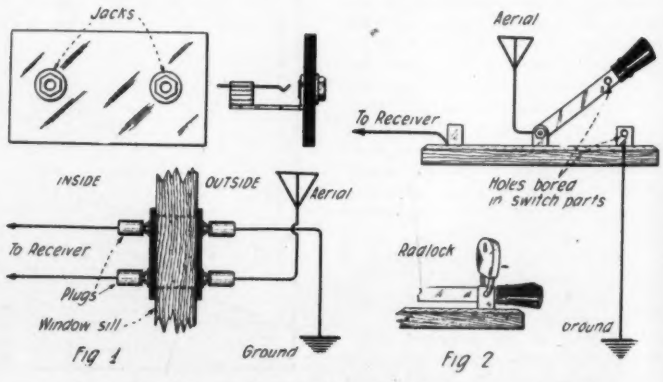
The RC Westinghouse receiver together with "A" or "B" batteries has been cleverly concealed in a "cellarette" which, prior to the enactment of the Volstead law, housed a varied assortment of the "finest" that could be obtained.

In making his installation, Mr. Hart did not fail to do everything in a most efficient manner. The mainmast is shown in the photograph. It has for its bottom section an "A" frame constructed from two 4-foot by 4-inch pieces. The topmast being a 4-foot by 4-inch piece so arranged that it can be raised or lowered between the "A" frame. This mast measures 60 feet from ground to pulley. The two wires of the antenna run from this pole to another one on the top of the second story of the house. The antenna is seventy-five feet long between spreaders with a sixty-foot lead-in.

Instead of providing the usual lead-in from the antenna to the receiving apparatus a highly efficient lead-in was designed and installed. Two pieces of 3/16-inch bakelite each measuring 4 feet by 18 inches were provided for the panels on the inside and outside of the window sill. Single jacks were mounted on each one and connected together through the sill of the window. The sill was cut out enough to give the jacks and leads proper clearance. This method of lead-in construction is described in figure 1. By removing the plugs inside the house the antenna and ground are removed from the room and are automatically protected

(*Continued on page 76*)

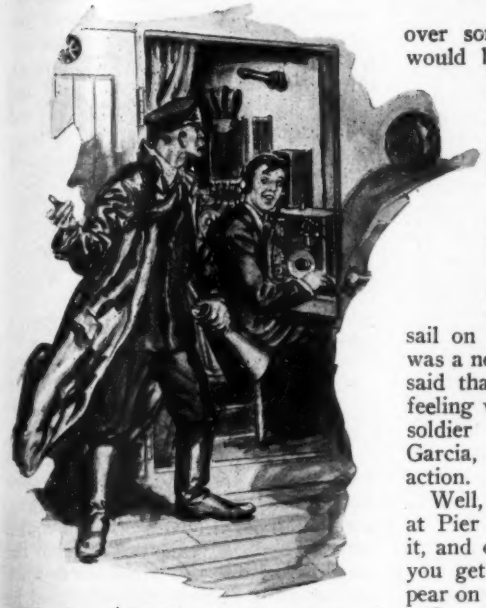
Mike S. Hart, who listens to all the broadcasting stations and says "This is the life"



Constructional details of the lead-in connections and ground switch

The Station of Greenhorn's Fate

By Ortherus Gordon



IN the oak-wainscoted offices of the Dot-Dash Radio, they knew that the steamship *Lake Shore* was a lemon, for after an operator had taken her for a trip, he invariably went back to the office stool or the plow. She was too much for even the most accomplished of men, and the individual who could get anything besides an ugly disposition out of her radio outfit could squeeze water out of a stone.

But she had to be manned. Her articles called for one radio operator, and he had to be furnished.

The Dot-Dash couldn't send a man down to the ship the morning it docked, because he'd peek in the ports of the radio shack, size up the set and promptly leave with his bag and baggage. Neither could they tell a man frankly just what he was up against, for at that time ships were plentiful and operators few. So they used the *Lake Shore* to break in the newcomers—if they still wanted to go to sea as radio operators after one trip on her, then it was considered that they were a somewhat permanent part of the Dot-Dash organization.

The set would work—but it also worked the operator. Legally and theoretically it was O. K. In other words, it had been passed by the inspectors, but it never in the world had been approved by the board of censors—the radio operators who struggled to put traffic through it.

The usual procedure was hardly fair to the newcomer. While sitting in the Dot-Dash outer office staring at the experienced men who were talking over some of their assignments, he would be approached by the superintendent who would ask him if his name was Smith or Brown, or whatever it might be, in a tone that indicated that here was something special.

Did Brown think he could make a ship that was sailing that noon? It was ten o'clock. Well Brown had his things in a boarding house in Brooklyn and was hardly prepared to sail on such a short notice. But he was a newcomer, so he jumped up and said that he was ready to sail now, feeling very much like Farragut or the soldier who carried the message to Garcia, so eager was he to get into action.

Well, that was fine! The ship was at Pier Ten. Here was a note—take it, and deliver it to the Captain when you get there. Brown would disappear on the run.

So when an excited youth would come running down the dock just as the gang plank was drawing in, to throw a handbag on the deck and follow it up himself by a mighty leap, the Captain wouldn't be a bit surprised. He knew it would be the new wireless operator. He would tell you that some of them are so green that when they pick themselves and their bag up, they trace out the lead-ins from the aerial to find out whether the radio house is forward under the forecastle, aft under the poop deck or 'midships under the bridge.

That's how Blank came aboard on the particular trip of which this story will speak. However, he didn't look around in a dazed sort of a way nor did he ask a sailor where he would find the Captain. He had been on ships before, but the Dot-Dash people didn't know it and so he had been handed the Greenhorn's Fate, like scores of operators before him. He went straight to the bridge and reported to the Skipper, who looked at him and wondered if at last he had been gifted with an experienced man. Deciding that he had, he immediately produced the ship's articles and had Blank sign them without delay. Then he showed the new operator the radio shack.

The truth of the matter was that the Lake Shore didn't have much of a radio outfit—and what there was of it was crowded in a little room just aft of the bridge, along with the operator's bunk, washstand and clothes-closet. The bunk swung up against the wall, and when it was down and in position for use, the single chair had to be turned around so that the seat went under the bunk. Otherwise there was no room for it. The washstand was in the room mostly for effect—and to rest the pillow against when the sleepy operator wanted a new angle at which to lay his weary head. There was no running water, and no place for water to run if there had been—for the plumbing was of the type known as dummy, necessitating the presence of two buckets, one to hold the fresh water and the other to catch the used.

The sending appartus was in a cabinet against the bulkhead—an old prewar cabinet set, with a switchboard on top heavy enough and pretentious enough to run a power plant, and the instruments beneath on two shelves, closed off by doors. It looked all right, had a bronze identification tag on it which rated its power at one-half K. W., and its age at thirteen years, and in the words of Blank as he first saw it, "ought to make an audible sputter."

But when he tried to raise the coast with it at a distance of forty miles and failed, he began to look askance at the bulky array of instruments. He was forced to ask for a relay on the first noon position report.

The receiving apparatus was just as bad. It was a crystal outfit and never set for more than one minute at a time. The most hectic part about it was the test buzzer—that was going all the time. When ships were near or alongside, their signals came in like thunder and Blank could get them all over the dials. When they moved ahead—as ships always did—their signals faded away with them. "It's a horizon set," declared Blank, "pure and simple. The galena is pure, and its operation is simple."

After the first outburst of derision against the set, the quarters and the general arrangement of things on the bridge, Blank settled down to a systematic improvement of the situation.

In this he was far different from his predecessors. They had always listened to the talk and joshing of the wardroom, and then went straight to their combination boudoir and museum to lay their heads on the imbecile washstand and weep. Blank wasn't discouraged quite that quickly.

First he cleaned the set—and had to use a solution of salt and vinegar to eat away the crust which had formed on the switch knives and terminals. Two days at that and he was ready to

take down the motor generator and go over its connections and contact points. He took a look at the spark gap, and decided that he ought to spend a day or two in the grease-covered compartment which served as a machine shop. He returned to the bridge deck with several entirely new parts and a few rejuvenated old parts, and these he placed in their proper places. Then he spent a day re-assembling the antiques on the lower shelves, and in putting the final touches on the polish of the brass and copper. Then he sandpapered the cabinet, and gave it a coat of varnish. The result was that the old set illuminated the room like a gilded idol.

SHE WORKS!

"I've broken all laws, and I haven't sent a message for five days," said Blank to the skipper, "but she looks absolutely beautiful. The question now is, will she go?"

He turned on the switch, threw in the generator and waited for developments. The sound of the motor and of the rest of the apparatus was infinitely quieter than before, and Blank turned with a pleased look to the skipper. But just then the lights went out, and the whirr of the motor died down to nothing.

"That means that she is drawing more than she formerly did, and that is a good sign," remarked Blank. "I may be able to do something with her yet."

"Consarn your hide," growled the Chief Engineer, appearing in the doorway. "Loan me your flashlight."

"Sorry, Chief. We'll just have to put heavier fuses in for this thing. She's got new life, B'gosh, and wants more feed."

Blank was right. The set had improved one hundred per cent.—and now the only thing he had to do was to tone up the receiver. He did this while in port in Cuba. The *Lake Shore* was in the sugar trade then, and was making monthly trips between New York and Nuevitas. Blank did what he could, but it wasn't much. He cleaned and tested all connections and made the switch contacts look like sterling silver. He didn't touch the inside of the box—other than to trace out the connections, and to correct one that had been misplaced by some previous operator.

Then he carefully and painstakingly went over the entire aerial system, taking it down on deck, testing the insulation and soldering the connections. He followed out the ground wire and led other wires to other suitable grounds, just for luck. Then he tuned in and listened, and for the first time that trip, was able to get the time ticks from Key West.

"Of course, it isn't much," he apologized, "but it's better."

Two more weeks and Blank was able to demonstrate that he had done what other men had declared impossible—and he did it in such a way as to bring fame both to himself and to the set on which he had worked so hard. The worst set on the Atlantic ocean—and the one that carried on communication with and brought rescue to the tramp steamer *Grange Meade,* ashore in a fog on Horseshoe Shoals, in Vineyard Sound!

Our sugar was landed in Boston that trip, and we unloaded in record time at the American Refineries just opposite the South Station. Then we took on some water as ballast, a Boston gentleman as pilot, and started on a thirty-six hour journey to New York, to pick up a return cargo for Cuba. That night we rounded Cape Cod in safety, and ran into thick weather. We didn't slow down, because we couldn't without stopping altogether, but we did blow our whistle and keep a sharp lookout for the various lights and a keen ear for their fog signals. We made each one successfully and at midnight were abreast of Pollock Rip Light vessel, which is at the entrance of a particularly dangerous channel.

ANCHORED IN THE FOG

The Pilot did not feel like risking it. "It's too foggy," he complained. "It will be better to anchor here until it clears. Weather like this always sends a few ships aground in there, and I'd rather be out of it."

Blank was on the bridge—the noise of the anchor had brought him out of his cabin in a hurry—and overheard the latter part of what the pilot said. "Weather like this always sends a few ships aground." If ships went aground, they sent out a call for help—and if that call for help was not answered, then all the ships in the vicinity were criminally negligent and responsible. Blank made a noble resolution—he would listen in all night!

He sat down at the table, after folding up his bunk so that there would be room enough, and put the headphones to his ears, half expecting to hear a chorus of SOS's the first thing. But all was calm. NAD (Boston Navy Yard) was getting off some traffic to an ocean liner, but outside of that the ether was dead. Hours passed and Blank still sat at the table, alert and ready for the least indication of distress. At three o'clock, he heard the *Grange Meade* calling NAD to get off a complaining message about anchoring if the fog continued and not being able to make Boston by morning, as previously reported. NAD acknowledged the message and then shut down. Blank set his inductance to the wave length of the *Grange Meade* and opened a book and tried to read. He struggled through one page and turned to the next, but before his eyes he could see only the words of the pilot, printed in large and emphatic letters: "Weather like this always sends a few ships aground—" Then he heard it. He thought he was dreaming at first, but there it was—nervous and insistent, an SOS from the *Grange Meade.* Aground on Horseshoe Shoals. Vessel apparently intact but assistance needed SOS.

TO THE RESCUE

Blank waited for a moment, and then opened up in reply. The *Grange Meade* responded with her position, and said she thought that a quick arrival might tow her away from the shoal before she had a chance to work on real fast. Blank answered that he had already notified the Captain, and that the anchor on the *Lake Shore* would be in its hawsepipes within a quarter of an hour. To this, he received two replies—one from the stranded ship, and the other from NAD.

"Attaboy, WDCB, go get her."

The pilot threw his fears overboard. He took bearings on the whooping fog signal of Pollock Rip, gave an order to the helmsman and rang the engine full ahead. With the break of day, the fog lifted and at six o'clock the *Grange Meade* was sighted on the starboard. She was headed in toward the beach—apparently had over-judged her speed and had turned in for the channel too soon. The *Lake Shore* went as close as possible and the two ships carried on a megaphone conversation.

It was decided to put a line out aft for the *Lake Shore* to pull on, and to get the engines of both ships at work at the same time. The plan was successful, and after two hours work, we all had the satisfaction of seeing the *Grange Meade* afloat. The Captain shouted his thanks, and said that he would make the proper reports to the Shipping Board. The answer to his call for help was prompt, he said, in fact very prompt. What was the radio operator of the *Lake Shore* doing on watch at that hour?

The skipper of the *Lake Shore* looked to Blank for an explanation. It hadn't occurred to him before.

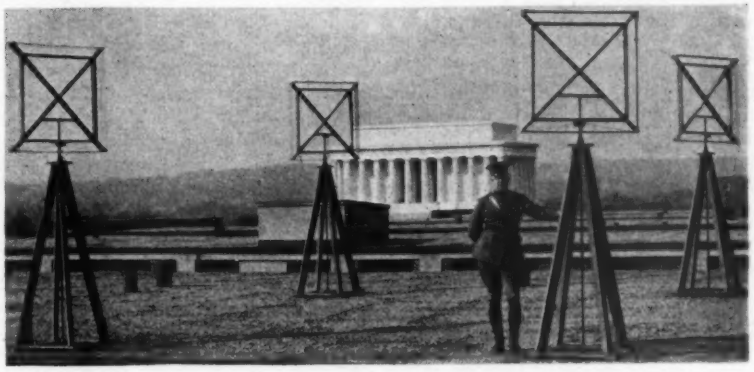
(*Continued on page* 83)

Four Loops and a Nation-Wide Radio Service

FOUR loops, containing ten turns of wire each and only 43½ inches square, on the roof of the Munitions Building in Potomac Park, Washington, D. C., make contact between the headquarters of the Signal Corps, United States Army, and its 70 radio-telegraph stations that form a net work of communication over the entire United States. Outposts of the ether, are these coils of wire hugging square frames making captive the electromagnetic waves for interpretation and use in a room twenty feet below.

Captain R. B. Woolverton, officer in charge of the radio plant and intelligence division of the Signal Corps, and his corps of assistants, when located in Room 3435 of the Munitions Building, immediately under these loop antennae, are enabled to copy radio-telegraph signals being transmitted from Chicago, St. Louis, Columbus, Atlanta, Indianapolis, or other strategically located high-power wireless transmitting stations functioning in the communication system of the United States Army. If any one doubts the efficiency of an antenna system involving the use of a few turns of wire wound around a square frame, the daily demonstrations of the four loops will serve to dispel the skepticism.

The installation of this antenna system for the reception of wireless signals at headquarters of the Signal Corps of the United States Army is characterized by novel aspects. Tentatively, the four coils of wire were placed on the roof of the building and by the use of bags of sand their positions were made secure. The temporary installation, however, was supplanted by the arrangement shown in the photograph. The illustration of this antenna system, excellent as it is, does not fully reveal the manner of planting and controlling the loops on the top of the building. Control of the loops is automatic, more or less. The lead-in wires pass through a brass pipe that reaches to the radio-telegraph receiving instruments in a room twenty feet below. Manipulation of this rod by the radio operator effects a change of the direction of the loop. The four loops are not only made rigid in position with relation to wind and stormy weather, but the shielding of the extended portion of the coil of wire for the twenty feet between the body of the loop of wire and the wireless receiving room, possesses the added virtue of eliminating "mush" or like forms of interference that have their origin in such high-power arc-transmitting stations as Annapolis and Arlington.



The four loops by which radio messages are received from 70 different points in the United States

Another innovation introduced by Capt. Woolverton in facilitating the reception of wireless communications from the network of Signal Corps radio-telegraph stations is the use of a so-called "battery room." Instead of maintaining separate storage batteries for lighting the filaments of the different wireless receiving sets employed in Washington headquarters, an entire room is reserved for the storage and dispensation of power for lighting the vacuum tubes. Voltage for the operation of the plates of the bulbs likewise has a common source in this battery room.

A third room assigned to Capt. Woolverton is known as the "intercept room." Here it is a daily occurrence to copy wireless messages sent by any of the high-power radio-telegraph stations in the world.

At the time this article is written, the points reached by the United States Army radio-communication system number 70, all told. Two high-power radio-telegraph transmitting stations are in the course of construction, one located at Salt Lake City, Utah, and the other at Fort Leavenworth, Kansas. These strategically located stations give the Signal Corps a trans-continental system of wireless communication. A 10-kilowatt tube transmitter will be installed in the Salt Lake City station, which is considered equivalent to a 30-kilowatt arc transmitter. The effective range of this far-western wireless station will be approximately 2,000 miles. The newly-built station at Fort Leavenworth will be capable of handling the traffic of the Eighth Corps Area (the Signal Corps system being

The receiving room located in the Washington Headquarters of the Signal Corps

The "Intercept Room" at Washington. These 100-turn loops intercept messages from all parts of the world

divided into nine Corps Areas), which includes twelve points in Texas and Arizona. There are also in operation 30-kilowatt arc transmitters at both San Antonio and El Paso, Texas. The transmitting equipment at the Atlanta, Ga., radio-telegraph station is to be enlarged, a 5-kilowatt tube transmitter displacing the 1-kilowatt tube transmitter now in service.

The automatic relay recorder designed by Francis W. Dunmore of the Radio-Communication Section of the Bureau of Standards, United States Department of Commerce, has been introduced in the United States Army communication system. Capt. Woolverton, who has developed this intelligence system from a mere beginning in 1919 to the present trans-continental "blanket" in touch with 70 points in the United States, is gratified at the results obtained by use of the Dunmore radio recorder. It is an instrument that facilitates the handling of traffic by avoiding the necessity of a telegraph operator copying the messages at relay points when the communications are trans-continental in scope. For instance, by the installation of this "mechanical radio operator" at Fort Benjamin Harrison, Indianapolis, Ind., the headquarters of the Signal Corps in Washington is enabled to copy wireless signals being transmitted from any of the mid-western stations, including Fort Omaha, Neb., and San Antonio, Tex. This automatic recorder is to be installed at the new 10-kilowatt-tube transmitting station at Salt Lake City, Utah. The installation of this unit will enable headquarters of the Signal Corps in Washington to copy signals directly from San Francisco and Omaha. Formerly, traffic originating in Washington with Omaha as its destination, was copied by the station at Indianapolis, Ind., and re-transmitted.

Basic Principles in Receiver Design

THE radiophone set is not complete without its receiving system. The received speech must be undistorted and be received exactly as transmitted. Certain fundamental principles must therefore be considered in receiver design.

In the first place what is the exact form of the waves which are received? Suppose that the frequency of the unmodulated wave emitted by the transmitter is f and the amplitude is A. Then the equation of the current in the transmitter antenna will be given the usual formula

$$i = A \sin 2\pi \text{ ft} \quad (1)$$

where t represents the time. Now when this wave is modulated there is superimposed on it another audio-frequency wave of current due to the speech. Let us say that the frequency of this audio current is F and its amplitude is B. Then the equation of the speech wave which modulates the radio wave will be given by the usual formula:

$$I = B \sin 2\pi Ft \quad (2)$$

During modulation these two current waves, equations (1) and (2), are super-imposed on each other and the resultant modulated wave is a combination of both which can be determined by mathematical analysis. The details of this analysis need not be given here, but the resultant modulated current has this equation:

$$i = A \sin 2\pi \text{ ft} + \frac{B}{2} \sin 2\pi (f + F)$$

$$+ \frac{B}{2} \sin 2\pi \text{ (f} - F) \quad (3)$$

This equation shows that the modulated current is composed of three components, one having a frequency of f, the unmodulated radio frequency; the second having a frequency of f+F the sum of the radio and audio frequencies. The third having a frequency of f—F, the difference of the radio and audio frequencies. Thus the radiated modulated wave has not a single frequency, but is a band of frequencies ranging from f — F to f + F. Consideration of this fact is important in the design of radiophone receivers. The radiophone receiver must not be a highly selective receiver for the following reasons:

Speech frequency ranges from 300 to 3,000 cycles per second, and in order that the received speech be a faithful copy of the transmitted speech it must not destroy any of the speech frequencies. Suppose the radio frequency is 100,000. That is the transmitted unmodulated wavelength is

λ = 3000 meters. f = 100,000.

Suppose we assume that the speech frequency averages about 1,000 cycles. Then the modulated current will range in frequency from f — F = 99,000 to f + F = 101,000.

If the receiver is a highly selective one and tunes very sharply, say to 100,000 cycles, then the components of the received wave having a frequency of 99,000 and 101,000 cycles will be eliminated by the sharp tuning, with the result that the received current is not a faithful copy of the speech and distortion results. In other words in order that the received current be identical with the transmitted speech, the receiver must tune equally well to the lowest and highest frequencies, in the above case to 99,000 and 101,000 cycles. Thus the important principle is established that for radiophone receivers tuning must be broad.

It is obvious that the higher the audio frequency the broader the receiver tuning will have to be. For in the above case, audio frequency being 1,000 cycles, the difference between lowest and highest frequencies is 2,000 cycles, or 2 per cent. of the radio-frequency unmodulated. Suppose we consider the case where the high musical tones are transmitted, where frequency of speech is say 3,000 cycles, then f — F = 97,000 and f + F = 103,000, thus in this case there is a difference betwen lowest and highest frequency of 6,000 cycles, which means a percentage deviation from the unmodulated radio frequency of 6 per cent., which obviously requires much broader tuning to get this band of wavelengths in. It is for this reason that the speech on many receivers sounds low and drummy. For due to the fact that the receiver is sharply tuned to the unmodulated radio frequency, it eliminates those frequencies, and the higher tones are therefore absent from the received speech. In the above case, if the receiver were tuned say to 100,000 cycles, it would receive fairly well the frequencies 1,000 cycles higher or lower. But due to the sharp tuning it does not receive equally well the frequencies 2,000 or more higher or lower than 100,000 and therefore the speech sounds drummy.

The receiver which is used for damped wave telegraphy will be capable of receiving speech. For although the speech waves are continuous—unlike damped waves which are not — the speech modulated waves have a varying amplitude which actuate the telephone receiver after being properly rectified by the detector, crystal or tube. The difference between the telegraph receiver and the speech receiver is that the telegraph receiver is generally made very selective, whereas, as explained above the speech receiver requires to be broadly tuned. Hence, contrary to the design of radio telegraph receivers, the high resistance, high decrement receiver is the better design for radiophone work. Although the speech intensity might be less than on the other highly selective type of receiver, the quality of the speech will be good, clear and intelligible.

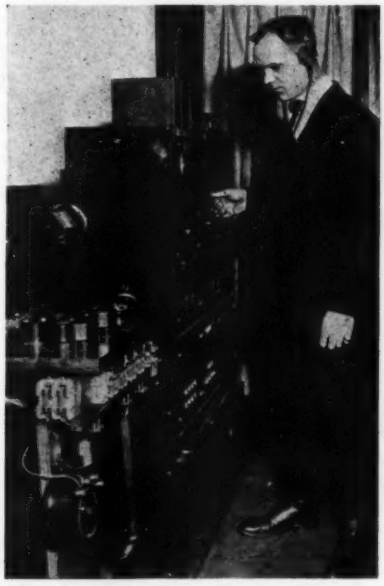
Converting Sound Into Electricity

By Bernard Steinmetz

IN broadcasting or any other form of radio telephone communication what is really radiated from the antenna is a form of electricity, namely electro-magnetic waves. These waves have been shaped to correspond with the speech or concert which is being broadcast. It is therefore of interest to inquire how the original sounds coming from the instrument or mouth are converted into electricity so that they may be radiated by means of electro-magnetic waves. This subject will be explained here very simply.

In the first place the reader should have a clear idea as to what sound really is. If you take a tin pan and tap it with your fingers you hear the familiar tinny sound. What has actually been done here is that the tin pan has been made to vibrate by tapping it. The vibrations of the tin pan set the air surrounding it also vibrating, when the tin pan moves outward it pushes the air out thus compressing the air, and when it moves inward the air rushes back. This vibration of the air is transmitted to the ear drum which likewise begins vibrating and a sound is heard. In other words a vibrating body emits sound. The reader will recognize the very familiar case of the tuning fork which emits sound when it vibrates. When such a body vibrates and sets the air in motion we say that the sound is due to "sound waves" which are really air waves generated by air in motion. When a person speaks he therefore sends out sound waves or air waves. When these sound waves strike another object this object begins to vibrate similarly, as for example the ear drum. With this preliminary statement as to what sound is we may proceed to the subject in hand.

In radio telephony and broadcasting the same means are employed to convert sound into electricity as are employed in ordinary wire telephony. A special type of instrument is employed which, in conjunction with a proper electrical circuit, converts sound into electricity. This instrument is called the "microphone," or "telephone transmitter." The mouthpiece of the ordinary wire telephone in the booths throughout the city is right in front of this "microphone." A similar device is used for radio telephony and broadcasting which does the same thing that the wire telephone microphone does, only it may be larger and somewhat differently designed.



The feeble currents in the microphone are amplified by a gradual step-up process, just as in receiving, and the method of controlling this amplification has been so thoroughly developed that it is possible at all times to insure a uniform volume, as well as correct any distortion of the original sounds which may occur

When we talk into the mouthpiece of the booth telephones we send out certain sound waves. These sound waves are collected in the mouthpiece and they strike a very thin sheet of metal, called the "diaphragm." As a result this diaphragm begins to vibrate also, as we explained in the first paragraph, and the vibrations of the diaphragm are in exact unison with the sound waves sent out by the speaker. In order to understand now how the vibrations of the diaphragm convert the sound into electricity we must examine the simple electrical circuit of figure 1. Here we have a simple battery, which may be nothing more than a dry cell, in series with a resistance R which may be rapidly varied in value, and an ammeter A which tells us how much current is flowing in the circuit. When the slider on the resistance R is put in a certain definite position, say at the very end at point C, the ammeter reads a certain current. If we decrease the amount of resistance in the circuit by moving the slider towards point D the current will grow larger which will be shown by the ammeter A. In other words every variation in resistance of the circuit will be duplicated by a corresponding variation in the current. If we move the slider on the resistance very rapidly up and down the current will vary very rapidly also. If we can make the sound waves which strike the diaphragm of the microphone vary the resistance of a circuit we will have electrical currents set up which correspond to these sound waves. This is done in the following manner.

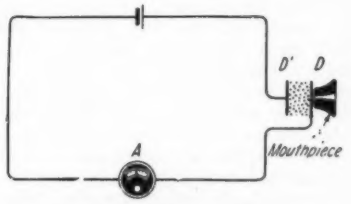


Figure 3—Telephone circuit with ammeter to register the variation in current

In the diagram of figure 2 we show all

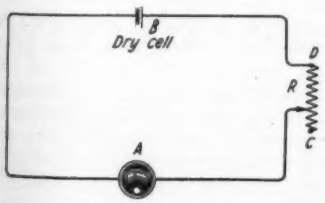


Figure 1—Simple electrical circuit having a battery, resistance and ammeter

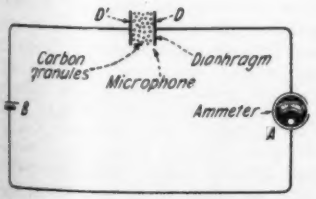
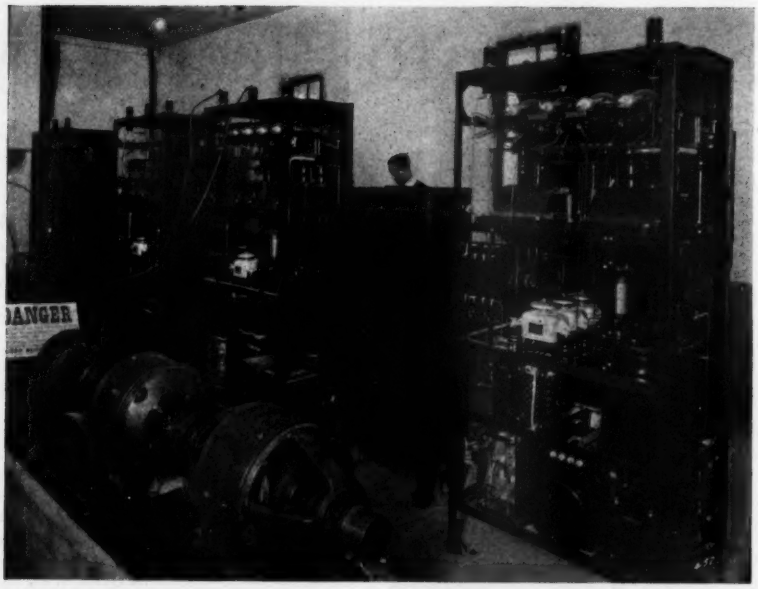


Figure 2—Circuit containing a microphone as the resistance element

In converting sound into electricity in broadcasting for instance, the music is first picked up by a microphone located near the instruments. In this case the microphone is concealed inside the circular housing which is on top of the pedestal



Standard radiophone transmitting equipment where radio power is generated and where the volume of sound from the microphone and control unit is further amplified and then radiated into space from the antenna

the elements of figure 1 except that instead of the resistance R we have two thin sheets of metal, D D′ sheet D′ being fixed in position so that it cannot move, while D is able to move back and forth, in other words it can vibrate. Between these two metal sheets the space is filled with small granules of carbon. These carbon granules between the two metal sheets correspond exactly to the resistance R, for we know that carbon is a conductor of electricity which offers a resistance to the flow of electricity. It is also a variable resistance for this reason. Between the carbon granules there are small air spaces. When the carbon granules are packed close together tightly there are fewer air spaces and the carbon granules make better contact with each other and the end metal plates. The resistance of this combination is therefore low. When they are packed loosely the air spaces between the carbon granules increase, the carbon granules make poorer contact with one another and the resistance is therefore greater. For every different pressure which is exerted on these granules therefore there will be a different resistance, and therefore a different current will flow through the circuit.

Suppose now that we speak in front of the metal sheet D which is free to move. The sound waves coming from the mouth set the air in motion and produce the sound waves in air. These air or sound waves strike the diaphragm D and set it in motion in unison with the sound waves coming from the mouth. When the sheet D moves backward it compresses the carbon granules moving them closer together and thus reduces the resistance of the carbon device. This immediately results in an increase in current. When the sound waves result in the sheet D moving forward it reduces the pressure on the carbon granules; they fall apart and separate more and the resistance increases, and the current decreases. In other words the metal sheet D vibrates in unison with the speech waves which strike it; its vibrations alter the resistance of the carbon device to which it is attached. But the important point to note is that the resistance changes correspond to the sound wave. Thus if the sound wave is a strong one the resistance alters a great deal because it changes the pressure on the carbon granules a great deal by moving the diaphragm D in more strongly. Each variation in the sound wave thus produces a proportionate alteration in the resistance, and therefore a proportionate alteration in the current flowing in the circuit.

If we place a funnel shaped mouthpiece in front of the diaphragm D as shown in the drawing of figure 3, we will have a device which collects the sound waves and thus concentrates them on the diaphragm D. This is the usual telephone microphone. We see therefore that with such a device as a microphone, which consists of a chamber of carbon granules and a movable diaphragm, we can obtain currents which correspond to speech. Only sound waves strike this diaphragm D. But after the sound waves strike the diaphragm we obtain currents which alter and change just as the sound does both in quality and intensity. Of course the reader should understand that before any sound waves strike the diaphragm there is a current already flowing in the circuit. But this is a direct current of the same strength all the time and does not have the power to transmit sound. It is only when the current is varied in the circuit that it has the power to transmit sound. The current can be varied by the sound in the manner described above. We thus see how sound waves are really converted into electrical currents which vary exactly as the sound does.

This is exactly the manner in which sound is converted into electricity by the ordinary telephones in our booth and also by broadcasting telephones. The varying currents thus produced correspond to the sound waves and are therefore transmitted after being amplified. When we receive these currents in our receiver we hear sounds. The next question then is how are electrical currents converted back into sound which is exactly like the original sounds first sent out. This question will be covered in a later article.

An Efficient Crystal Broadcast Receiver

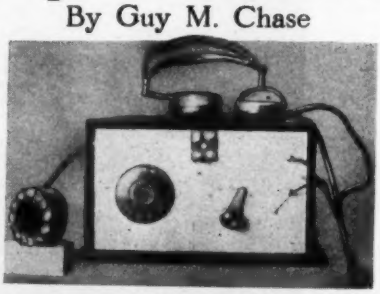
By Guy M. Chase

A BROADCAST receiver using a crystal and based primarily on the hookup and ideas suggested on page 71 of THE WIRELESS AGE for March, has been found by the writer a highly efficient crystal set. Located about 7 miles from WJZ and WOR, and about 15 miles from WEAF, it will separate any one of the three. It gives excellent signal strength. The cost is low and the construction is not difficult.

The coil is a honeycomb, home wound, tapped every five turns, with a total of 40 turns. The taps were taken off at one side at the nearest turn, so that the tapping varies by a turn or two in each group.

The hookup is exactly that of the article in THE WIRELESS AGE mentioned above except for the type of coil, with the addition of a 23-plate (.0005) variable condenser across the secondary, or detector, circuit.

Without this condenser the coil will not tune to 400 meters on a 100-foot aerial. With the condenser it tunes a trifle above that point. By use of the taps and condenser it is possible to exactly balance the circuit at 360 or 400 meters and attain a remarkable degree of tuning.



The crystal broadcast receiver completely assembled

This set has been used on a 100-foot overall antenna and a 120-foot overall antenna, both outside, and two inside attic aerials, giving high signal strength for crystal and remarkable tuning for a tight-coupled crystal set.

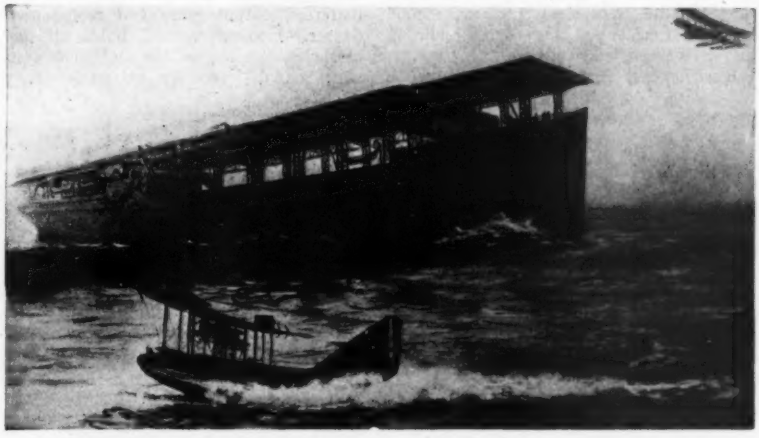
This set, as well as the one on which it was based, derive their high efficiency in large degree from the fact that the wire in the coil is no more than is required for tuning to 400 meters, or thereabouts. Doubtless the results would be in proportion were the coil wound for any other wave length. Both avoid the series antenna condenser which, while it adds to selectivity in tuning, frequently cuts signal strength, of which there is none to spare in a crystal set. Were the coil wound close enough to avoid even a shunt condenser, the result would doubtless be a further increase in signal strength.

Installing Radio Laboratory on a Mastless Ship

New Airplane Carrier Presents Novel Problem to Wireless Engineers—Collapsible Masts and Disappearing Operating Room Used

ONE of the most unusual vessels of the United States Navy is the *Langley*, a new aircraft carrier. This has a flat upper deck devoid of funnels, masts or other obstructions, on which airplanes can land and from which they can take off. Being mastless, one naturally wonders how her wireless aerials are provided for, and as a matter of fact much original work had to be done in order to install the radio apparatus and make it practical in operation.

The ship, besides being a floating landing field and "mother ship" for airplanes, is also provided with the most complete radio equipment, as she is regarded by the Navy as a sea-going laboratory for the study of radio communication problems between ships and airplanes.



Telescopic masts and an elevator operating room solved the problem of radio work on the airplane carrier "Langley"

Her great flying deck, which stretches for 520 feet from stem to stern and is 65 feet wide, prevents the erection of permanent masts for radio or other purposes—her "top sides" must be clear for the launching and landing of her aircraft. Special telescopic masts have been installed amidships, approximately 250 feet apart, fore and aft, which can be elevated when desired, and housed below decks when planes are being projected into the air by the catapults or alighting on the spacious upper deck. The masts, 50 feet in height and used primarily for the radio aerials, are controlled by hand-operated gears which raise and lower them somewhat as periscopes are operated. When lowered, the aerials are unhooked and stored below or laid alongside the palisades which guard the edges of the flying deck. The masts are elevated simultaneously after the antenna wires are hooked on. This aerial is the principal one used for long distance communication.

Auxiliary antennae are carried aft along both port and starboard sides. These antennae are hung outboard on davits which can be swung in like ordinary boat davits, and housed close to the vessel's side when not in use. Primarily these antennae are used to work nearby land stations and aircraft when aloft, as they do not interfere with the operation of the landing deck. At sea with no aircraft aloft, the vessel uses its mast antennae, but when planes are taking off and landing, the auxiliary side antennae are used, although the masts could be raised for transmitting a message and then lowered.

Located below decks is the usual radio room found on all men-of-war with its equipment for transmitting and receiving, generators, batteries, etc. The days of a radio house on the "top side" of military ships has passed. Today the operator on watch sits below instead of "on top of the world" as on merchantmen and liners.

When operating with the radio compass on the *Langley*, however, the radio man comes up on the top deck and brings his house with him. In this very important work, an original idea has been carried out by the Naval constructors. For ascertaining the position of aircraft, ships or shore stations, the radio compass house, built on the lines of an elevator, is run up to the top side, where it projects above the deck like a pilot house. Its operator can raise and lower it at will, and from its location aft on the starboard side he can take bearings without interrupting the operation of planes as they land or depart. The roof of his house when he is "up," forms part of the deck of the flying platform when he is "down."

Below in the radio room the ship has a regulation Naval 2 kw. spark set for ordinary traffic work, but there is also a 300-watt tube transmitter, using six 50-watt tubes. This set is adaptable for use either as a radio telephone or as a telegraph apparatus with I.C.W. or C.W. For communication with the aircraft in the vicinity of the mother ship, either on the sea or in the air, the 300-watt set is used.

Another feature of this unique vessel is the plane elevators which raise and lower planes from the storage hold below and the top of the elevators forming part of the ship's deck when they are "down" like the radio house roof. Forward and aft are the catapults for launching the planes, as well as the arresting gear for stopping them when they land. Most of the usual "top side" equipment of an ordinary ship is below the flying deck, such for example as the pilot house, which is well forward, port and starboard jib cranes for lifting sea planes from the water, the four 5-inch rifles, and deck houses. Her two funnels project from her sides toward the stern, where they may be turned upward, aft or downward to keep the smoke from the upper deck.

Great results are expected from the *Langley*, the first aircraft carrier of the Navy, and many advanced experiments in radio communication with aircraft are planned. The lessons learned in radio and practical aeronautical operation at sea will be incorporated in the new aircraft carriers which the Navy will build out of two battle cruisers scrapped by the Armament Conference.

A Complete Portable Tube Receiver

By Carl Dreher

THE set herein described is a single-tube receiver with provision for carrying every part and accessory within the cabinet itself, including even antenna and counterpoise equipment. In short, the degree of portability aimed at is that of an ordinary film camera, while at the same time there has been no attempt to produce a vest pocket apparatus or something to be worn in one's necktie. These novelties make good publicity material but are correspondingly weak in receiving efficiency.

When the case is closed the set may be carried by a handle like an ordinary small satchel. The filament and plate batteries, telephone receivers, tools (pliers and a screw driver), and wire suitable for a portable antenna, are all in the case and the outfit may be set up in a few minutes for actual receiving. A suitable size of wire for use with portable sets is about No. 24; the writer has had an antenna of this material up for several months during the winter, and it is still aloft and giving service. The total carrying weight of the set is 12 pounds. There is nothing to connect except the antenna. A dry cell tube is of necessity used.

Figure 1—The complete receiver inclosed in portable case

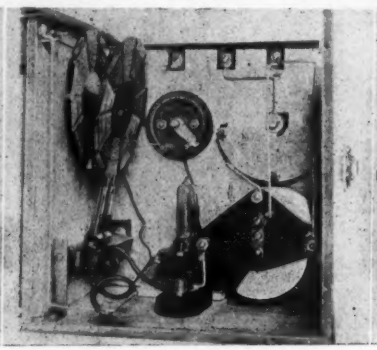


Figure 3—Interior view

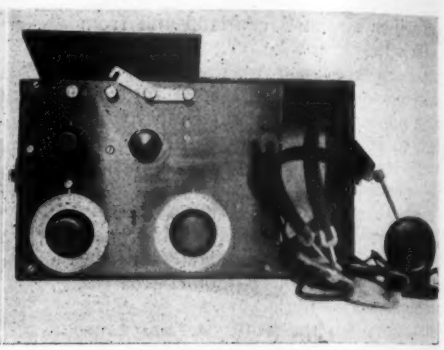


Figure 2—Ready for operation

The first four figures show the general appearance of the set. Figure 1 is a photograph of the receiver with the cover on, ready to be carried. Figure 2 is a view showing the set ready for reception. Figure 3 is an interior view from the back.

The cabinet, as these pictures show, is an affair with two partitions and three compartments, designated as compartments A, B and C, respectively. Compartment A, the largest, shown in the photograph of figure 3, houses the receiver proper—that is the tuning equipment. Compartment B is for the batteries, output jack, and telephone condenser. Compartment C holds all the accessories, including the telephones. The panel of the receiver extends over compartments A and B, C being left open. When the set is being carried the open side of compartment C is on top, so that the material placed therein remains in position. The interior of compartment A is made readily accessible by making the top a hinged door for changing coils, etc. The middle compartment holding the batteries is rarely opened; access to it may be had by removing the back of the cabinet and the piece which forms the top of compartments B and C, a screw-driver being necessary for this.

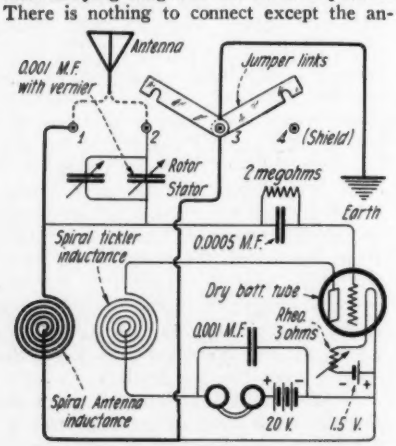


Fig. 4

Wiring diagram

The hook-up used is a simple tickler coil regenerative one, without any particularly novel features. The inductances are in spiderweb form. The only novel, though in no way original, feature is the use of three binding posts, with an optional fourth one in case the receiver is shielded, with link jumpers, to allow the antenna tuning condenser to be used in series with the antenna inductance, or in parallel, which properly used, gives a wide wavelength range without loss of efficiency. With the antenna connected to post 2 in figure 4, and link 2-3 open, the series connection as shown in figure 5 is obtained. With posts 2 and 3 jumped, and the antenna to 1, the ground, as before, going to post 3, the parallel connection of figure 6 is secured. At the lower wavelengths the series connection is used for sharpness of tuning. At the higher wavelengths the parallel connection may be efficiently employed with a small antenna. Interchangeable inductance coils are used to get away from the energy losses involved in the use of tapped inductances.

The spider web inductances are wound on frames. These may be obtained in 1/16-inch bakelite in most of the larger radio supply stores. They are sold wound and unwound; four of the latter "fans," as they are known, should be obtained, one for the

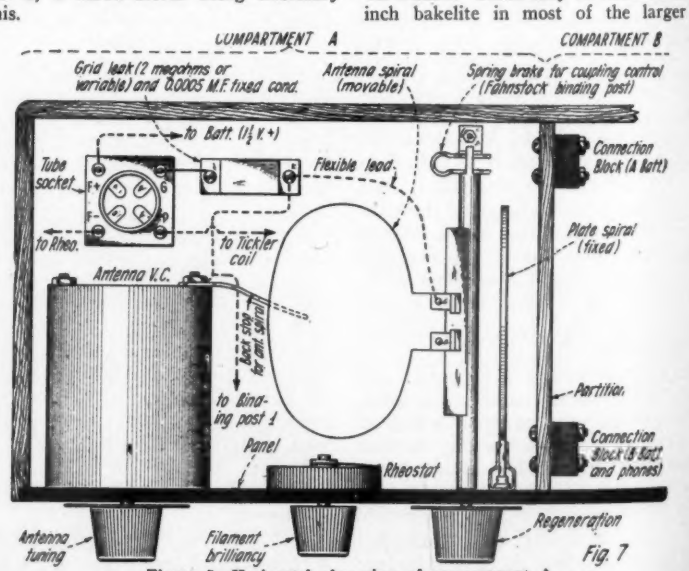


Fig. 7

Figure 7—Horizontal plan view of compartment A

tickler and three for antenna inductances.

Winding data for the spirals, and wavelength range which may be expected with a small single wire antenna, are given in the table below:

	Wire	Turns	Range in meters with antenna 80 feet long, 28 feet high, ground lead 15 feet antenna condenser	
			Series	Parallel
Tickler Inductance	No. 26 D. S.	50		
Antenna Spiral No. 1.....	No. 26 D. S.	18	100-280	
Antenna Spiral No. 2.....	No. 26 D. S.	50	200-470	500-1600
Antenna Spiral No. 3.....	No. 30 S. S.	80	400-800	1400-2900

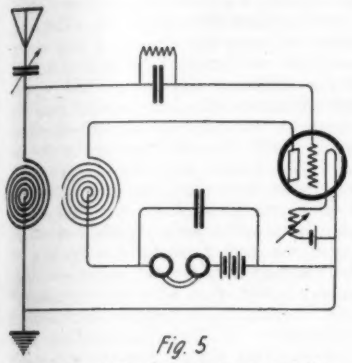


Fig. 5

Series connection of the antenna variable condenser

The design of the inductances and the effective wavelength ranges were determined by trial on two antennas of the size given in the table, but in the one case in a rural location, the height being directly above flat ground, while in the other instance the antenna was stretched some 8 feet over an apartment house roof with the set in a top-floor apartment. Larger antennas will give somewhat greater ranges. Spiral No. 1 is used for 200-meter amateur telegraph reception. Spiral No. 2 is connected in series with the condenser for reception from the present order of broadcasting stations (360 and 400 meters), while with the condenser in parallel it is good for 600-meter marine reception, radio compass on 800 meters, and will just reach some of the Navy spark transmitters on 1,600 meters. Antenna spiral No. 3 is mainly employed with the parallel connection, and covers WCC, WSE, and NBD around 2,000 meters and up, C.W. and spark marine traffic from 1,600 to 2,200 meters, NAA spark on 2,600 meters, and a great number of Army forts between 2,000 and 3,000 meters. The ranges as given are the most effective but are not the actual limits which may be reached; spiral No. 3, for example, will actually go down to 600 meters with the condenser in parallel and almost all the capacity out, but it is hardly convenient to work it in this way. One change in design is suggested: If an antenna slightly longer than 80 feet flat-top is available, spiral No. 3 may be wound with No. 30 D.S. wire and a few less turns, and still go up to NAA on 2,600 meters and WSE's arc slightly higher. It is always best to use double serving insulation when possible.

The layout of the apparatus in compartment A, seen from above, is given in figure 7. This is with a WD-11 or WD-12 tube and has been found to be a suitable position. The receiver is wired with some form of stiff conductor equivalent to No. 16 B. & S., or larger. Bare bus bar wire is recommended. It will be noticed that the parts are so laid out that the tickler coil is the one nearest metal parts and conductors, while the antenna spiral, in which losses must be kept at a minimum, is kept well away from other conductors.

This set was designed for mobile reception and accordingly tests were made at Riverhead, L. I., using an aerial consisting of a single No. 24 wire strung between two trees. The dimensions of the antenna are given in the wavelength range table above. This type of antenna is highly suitable for a portable set; a few hundred feet of it may be carried on a spool in compartment C of the set, and suspended between lengths of sash cord thrown up into trees. A counterpoise of the same material is used. In the tests that have been made so far no attempt was made to cover extraordinary distances. On 200 meters telegraph stations were heard at night in every district except the Sixth and Seventh, only a slight amount of listening being done. It was found that KDKA could be relied on with an intensity varying from just audible to a comfortable loudness, at night, with about similar results on WGY (150 miles) and the New York City stations.

On 600 meters and higher waves the only listening done was in the daytime. Excellent signals were heard from NAM's C.W. on 600 meters (350 miles), and all the various Army and coast stations within 500 miles, working on wavelengths between 1,600 and 3,000 meters, were so good on both spark and C.W. on this small antenna, that it was evident very good night ranges could be secured. In New York the receiver was tested for tuning on broadcast stations, and no difficulty was experienced in holding WGY, 150 miles, on 400 meters, through WJZ radiating locally on 360 meters. The local broadcasters all came in satisfactorily and with one step of audio frequency amplification were good for loud-speaker reception in a small room; with the set alone, and ordinary telephones, the speech could usually be heard some four feet away. The results of the tests were considered satisfactory by several experienced observers and accordingly the specifications of the receiver are given herein for the use of amateurs and experimenters.

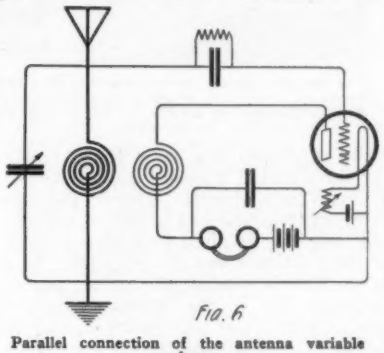


FIG. 6

Parallel connection of the antenna variable condenser

Directive Telegraphy

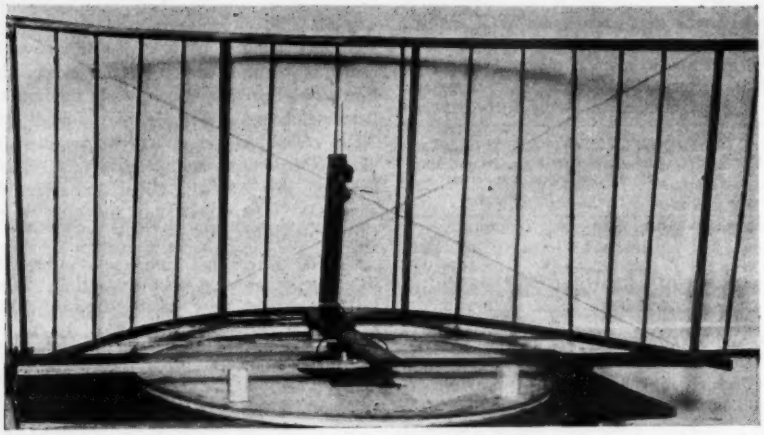
By Jerome Snyder

THE very first type of practical transmitting and receiving antenna to be employed in radio communication was the orginal vertical antenna as used by Marconi. There were no horizontal parts to this antenna and the chief directional characteristic was that it radiated equally well in all directions. This is well illustrated graphically by a directional "characteristic" curve which shows the signal intensity at a given distance from the transmittng antenna in all directions. Thus in figure 1 we have a plan view of a vertical antenna A. If now we measure the received voltage at a given distance from the antenna in all directions and plot the relative values of these voltages along a line in the direction pointing to the station where the received signal was measured we will have a curve as shown in figure 1. This is seen to be a circle which indicates that in every direction the received signal is the same at a given distance from the transmitting antenna. This indicates that the transmitter radiates equally well in all directions. In the same way if a vertical receiving antenna is used it will be found that it receives equally well in all directions around it.

There are a great number of disadvantages in radiating equally well in all directions which are becoming more and more apparent with time. For certain types of work this equal radiation characteristic in all directons is very useful. Thus when a ship in danger sends out its distress signal it is highly desirable that its signal be radiated equally well in all directions so as to ensure assistance. In general, however, the disadvantages of equal radiation in all directions are great. Some of the more important ones will be here considered.

In the first place there is a great congestion of the ether lanes with signals which are continually conflicting with one another. Thus although some stations are working with stations in a definite direction, they nevertheless radiate in all other directions and thus interfere with other signals. If the radiation were confined to the particular directions required there would be more room for new stations, and less interference would result.

At the present time the entire wave length has been pretty well divided up for the various different services. Yet new uses for radio are continually arising which would

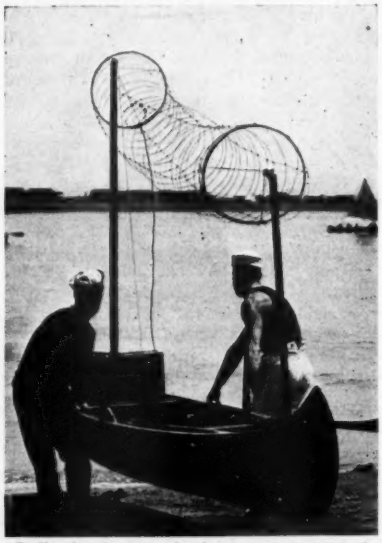


The semi-circular or "reflector antenna." The signals at the receiver vary in intensity as the waves are directed at, or away from the receiver. It is necessary that the size of such a reflector must correspond in meters in height and width to the wave length it is desired to reflect

really necessitate new wave length ranges for these uses if they are not to interfere with existing allotments. However the radio wave lengths are limited in number and thus new uses must be given wave lengths which are also assigned to other purposes. As a result there is considerable conflict and interference due to the limited number of wave lengths. This interference arises from the fact that the antennas radiate equally well, or almost so, in all directions around it, hence signals are bound to cross and interfere. If, however, signals were radiated and transmitted in definite directions it would be possible to apportion the same wave length for different uses and still avoid interference. For then the signals would be transmitted and received only in the direction required, and waves from different antenna would be less apt to cross and interfere.

One of the most important disadvantages of equal radiation in all directions is that this transmission results in extremely high inefficiency. Suppose a transmitting station is to communicate with a receiving staton due north of it. If the transmitter radiates equally well in all directions around it the reader will readily understand that only a very small fraction of the radiated energy will travel towards the desired receiving station. The rest of the radiated energy which travels to all other points of the compass is, in fact, lost as far as the purpose in hand goes. As a result the power of a transmitter has to be many times greater than that actually required to reach the receiving station. If an antenna were built which radiated only in the direction of the receiving station all of its energy would be concentrated on the receiver and none lost in any other direction. Thus the power of a transmitter could be effectively reduced by the amount which would be lost in wasteful radiation in other directions. This would mean an enormous saving in cost and operation of the transmitter. Thus directive telegraphy would result in both greater efficiency and greater economy.

In trans-Atlantic work the receiving station and transmitting station at one end are separated by a considerable distance, anywhere from 10 to 50 miles. There is a very good reason for this. If the receiving station were closer to the transmitter there would be considerable interference from the transmitter on account of the non-directive radiation from transmitter antenna which would prevent proper reception of trans-Atlantic signals. To avoid this receiving stations must be considerably removed from the transmitter. This has disadvantages, chief of which is the cost of intercommunication lines between transmitter and receiver, since it is necessary that these two parts of the radio system be in constant touch with one another. The more directive the radiation from the transmitter is the nearer will the receiving station be able to be moved to the transmitter, thus reducing the expense of telephone and telegraph lines between them.



Radio signals transmitted from an antenna of this type spread out in all directions

It is thus seen from the discussion so far that non-directive radiation from transmitter antennas has numerous disadvantages which it is very desirable to eliminate. The same applies to receiving antennas. Just as the transmitter antenna radiates in all directions so the receiving antenna receives signals from all drections. The vertical receiving antenna receives signals from all directions equally well. It will therefore be obvious that it must have the same disadvantages. Thus since it receives equally well from all directions interference will be a maximum, for it will receive signals from all directions as well as from the direction in which it desires to receive, and if other signals are at the same wave length or near it as its communicating station there will be interference. It is likewise inefficient, for if the receiving antenna could receive best in one direction less amplification would have to be employed to increase the signal intensity, which means at the same time an increase in economy.

On account of the above disadvantages efforts have been expended in the past to perfect antennas which radiate best in one direction. These antennas would eliminate all the disadvantages enumerated above and substitute the advantages corresponding to the disadvantages. At the same time other important uses of directive radiation would be available, thus by being able to transmit and receive in any direction desired we would be able to determne positions of ships at sea; we would be able to determine the direction from which other telegraphic or radio sig-

The larger steamships carry transmitting sets of high power and because the energy radiated from the antenna spreads equally in all directions it is frequently true that signals from a ship in mid-ocean can be heard equally well on both shores

nals originated thereby locating stations; secrecy of signaling might also be possible.

Apart from the above it may almost become a necessity to adopt directive methods of communication via radio because of the reduction of interference which it would entail and because of widening the use of existing wave lengths. Thus let us consider for a moment the 600-meter wave length. This used to be, and still is to some extent, the chief wave length for ship and other commercial traffic, such as ship to shore, short distance land communication, navy work, etc. Now obviously if a receiver were tuned to 600 meters it would pick up all signals on this wave length, which accounts for the terrific interference existing on this wave. Suppose, however, that transmitters and receivers were designed for directional work. Each transmitter would be radiating in the direction of the receiver and each receiver would be receiving best from the direction of its transmitter. As a result unless your receiver were working the direction of one of these 600-meter transmitters it would not be interfered with. Obviously then a larger number of transmitters would be able to work on the same wave length without interfering with others, since each transmitter would be working in a definite direction. Directive communication is therefore equivalent practically to an increase in the number of wave lengths.

Let us see what the aim of directive telegraphy is. Figure 1 illustrates the directional characteristic of the vertical antenna. The circle with the transmitter station at the center indicates that the transmitter radiates equally well in all directions. If the station at the center is the vertical antenna of a receiver the curve indicates that it receives equally well from all directions around it. Now figure 2 represents the directional characteristic of another type of antenna. From this characteristic we learn the following: If the station is a transmitter it radiates best in the direction OA and worst in the direction OB. It radiates almost as well in direction OC and OD as in direction OA. This system is thus partially directive since very little energy is radiated in the direction OB. However in the other directions it radiates almost equally well. If the station is a receiver the same conclusions apply as to its reception from the various directions. Thus it receives best in direction OA and worst in direction OB.

Actually what directive telegraphy or directive radio communication of any sort aims at is to have a characteristic of the form of figure 3. Here O again is the radio station. This curve shows us the following. If the station is a transmitter it

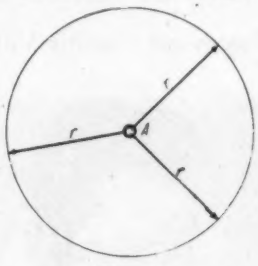


Figure 1

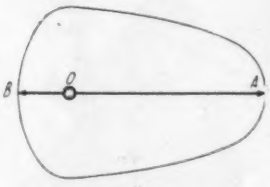


Figure 2

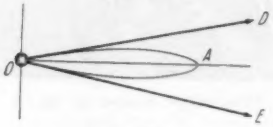


Figure 3

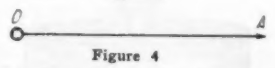


Figure 4

Directional effects from various types of antennas

shows that practically all the energy it radiates is radiated in the very narrow angle ODE. Thus all the energy is confined in an extremely limited space. It radiates best in the direction OA. Outside of the directions confined by the angle ODE it does not radiate at all. If the station is a receiver it does not receive signals which come from directions other than those included in the angle ODE, and it receives best from the directions OA. It will be at once evident that since the transmitter does not radiate outside the angle ODE a receiver situated in any direction outside this angle cannot be interfered with. Also since a receiving station with such a directional characteristic cannot receive from stations outside this angle ODE it will not be interfered with by transmitters outside the angle. The ideal type of directional characteristic is, of course, a straight line as in figure 4. This shows that the station either radiates only in the direction of the straight line and in no other direction, or receives only from that direction, but no other. However for all practical purposes a directional characteristic such as that shown in figure 3 is very satisfactory.

Directional communication can be accomplished to some extent by means of reflection, which was done in the infant stages of radio by Heinrich Hertz. By using so-called electrical mirrors the radio waves may be reflected like light in any desired direction. However this is not an efficient or even practical means, because for reflection it is necessary that the reflector be of the same order of magnitude as far as size is concerned as the waves to be reflected. Obviously if we desired to reflect a 600-meter wave the construction of a reflector 600 meters high and wide is by no means practical. For the shorter wave lengths such as 25 meters, it may have some practical uses. But radio communication at present takes place at waves between 200 meters and 15,000 meters. As a result this method is out of the question. It is of interest to mention this because it shows how at the very start of the radio art such important subjects were tackled, knowingly or otherwise.

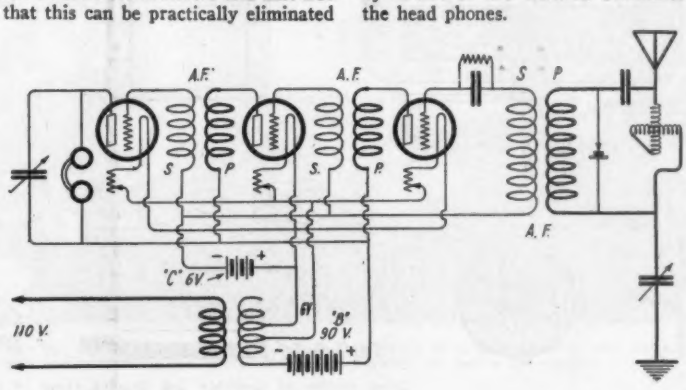
The practical development of directive communication via radio has been in the direction of the design of antennas. It has been found that certain types of antennas radiate better in some directions than others and receives better from certain directions than others. Attention has therefore been centered upon the development of antennas which have sharp directional characteristics and up to the present time four practical types of directional antennas have been developed which have proved to be successful to some degree. These four types of antennas are: (1) the horizontal antenna first introduced by Marconi; (2) the Bellini-Tosi triangular aerials; (3) ground antennas; and (4) loop antennas. Each of these have very important applications in modern radio communication.

Satisfactory Use of A. C. on Receiving Tube Filaments

A RECEIVING circuit, comprising a crystal detector and three steps of audio-frequency amplification, in which alternating current is used for heating the filaments of the tubes, has been developed by Stephen J. Leo. The circuit is giving satisfactory results, and Mr. Leo states that the tone quality is equal to that of a set using batteries for filament excitation and in addition the volume is somewhat greater.

A variometer is used for tuning purposes. The transformer for supplying current for the filaments is an ordinary 110-volt bell-ringing type, with four taps on the secondary side. The B battery supplies 90 volts for the plates of the tubes, while the C battery, used as a grid bias, consists of 6 ordinary 1-volt dry cells.

When the set is properly tuned there is very little hum in the receivers and Mr. Leo states that this can be practically eliminated by means of the variable condenser across the head phones.



Midget Receiver With Aerial Fits in Vest Pocket

By Raymond Francis Yates

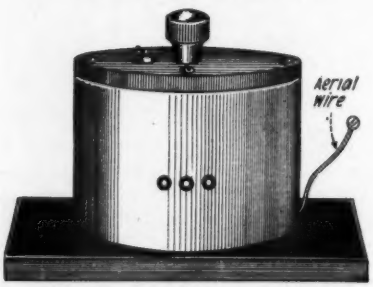
THE midget receiver epidemic has not yet ended. We have read descriptions of pocket radio outfits assembled in match boxes, bill folders, fountain pens, watch cases, etc., etc. And each one has been "the smallest set in the world," if we believe the newspaper caption writers.

Now this idea of a tiny receiver is fine. We would all like to have a little pocket set that we could tuck away in our vests, for the mere novelty of it. But what are we going to do for an aerial? Surely we cannot expect to find an aerial conveniently located wherever we wish to stop and use our instrument. Nor can we hope to carry 100 feet of No. 14 copper wire with us. Hence the idea of the pocket receiver seems doomed—but not so!

Who would think the sight of a fish pole with its line reel would inoculate one with an idea that would solve the pocket radio receiver problem? That was the writer's experience. The reel in question was a very small and compact one. Why not build a receiver with the aerial wound up in it? Very bright idea—very bright indeed.

A receiver was developed as a result. The drawings shown herewith are made without regard to size, for dimensions do not mean much to the fellow who wants to build one. He would change it anyway and the prospective builder is usually satisfied to get the general idea. The case itself can be turned up from hard rubber or wood. The aerial reel is in the base of the instrument. The disc which holds the wire on the reel should be of metal, since a small brush must rest on this to make the connection to the tuning coil. A little shopping may have to be done to get the wire for the aerial. A very small three-strand wire is used. It is very flexible and 65 feet of it are wound on the spool. A little handle is provided on the shaft of the reel so that the aerial can be conveniently wound up after it is used.

The midget receiver in use

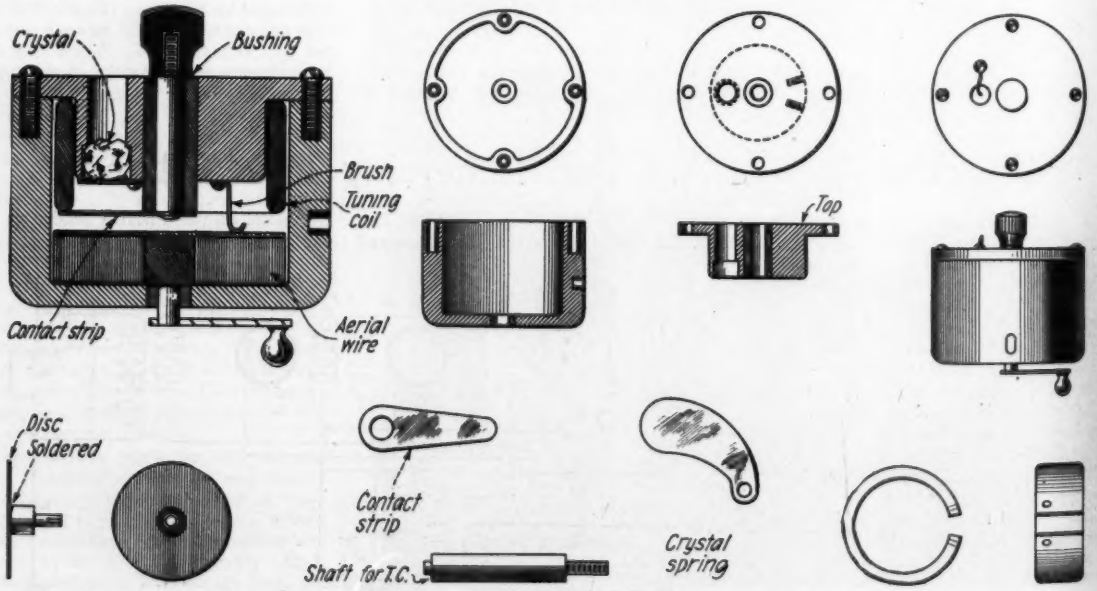


Showing the antenna connection

The tuning coil is very clever, I think. It is made in the form of a rheostat. In fact, if the builder browses around enough he may find a rheostat that will make a good cover for the container. In that event it will only be necessary to take the resistance wire off and rewind the thing with 390 turns of No. 32 enameled wire. A little fixed condenser of .0003 mfd. capacity may be made up and placed inside the case against the wall. The crystal is inserted in a hole bored in the top. The hole is counterbored through the bottom of the top piece so that there will be a shoulder against which the crystal is pressed with a small brass spring. The top is held down to the container with four machine screws. The cat whisker wire is attached to a screw on the top of the instrument. The free end passes into the hole containing the crystal.

Three other holes with brass bushings inserted in them are drilled in the side. Two of these brass bushings will be just large enough to accommodate the phone cord tips. The other hole is for the ground wire, which may be a flexible cord that can easily be slid into the vest pocket. To facilitate rapid connection it should have a spring clip at one end.

Carrying the perfection of this receiver a step further one can mount it back to back with a telephone receiver. When one wishes to receive it is then only necessary to pull the aerial wire out to full length, hang it up and listen in at the other end.



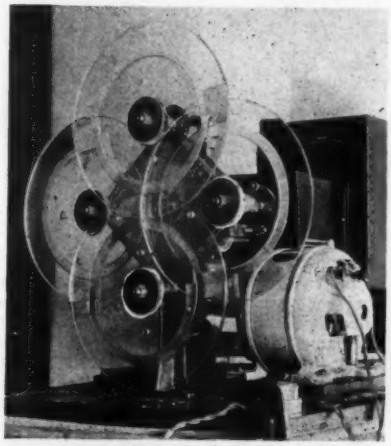
Cross section of assembly and detailed views of the various parts

Transmitting Photographs by Radio

By Otto Wilson

PHOTOGRAPHS have been sent by radio from Washington to Philadelphia, some 130 miles. The machinery of the invention is not complicated. It consists of two parts, a sending apparatus and a receiving set. In the sending apparatus there is, first, an ordinary projecting machine like that of the "magic lantern" used for projecting stills. A slide of the photograph to be sent is usually made (although this is not necessary), and is placed in front of the light as if to be projected on a screen, and both the light and the slide remain fixed during the whole process of sending. But the projected image does not remain stationary. For after the rays of light pass through the glass slide they are gathered together by a lens and made to shine through the outer edge of one or more glass disks, about the size of a dinner plate, which are being revolved steadily by a small electric motor, and which cause the image, if projected on a screen, to sweep across the screen several times a minute.

These so-called "prismatic rings" are really the heart of the invention, and they are the only part for which Mr. C. Francis Jenkins, the inventor, claims any particular credit. All other parts, he says, can be bought at any electrical supply house. The prismatic ring is a disk of ordinary glass about half an inch thick, the outer margin of which, for a space of about two inches running all the way around the disk, is beveled off to form a continuous prism. This prism is not uniform, but has an angle of deflection which constantly changes as you pass around the disk. This effect is obtained by continually decreasing the thickness of the glass on the outer edge of the disk and continually increasing its thickness on the inner margin of the two-inch band running around the disk. For instance, at a given point A, the glass on the outer edge is half an inch thick and tapers to a thickness of a quarter of an inch. On the other hand, at the inner edge of the two-inch band it is a quarter of an inch thick at A and it gradually increases as the circuit



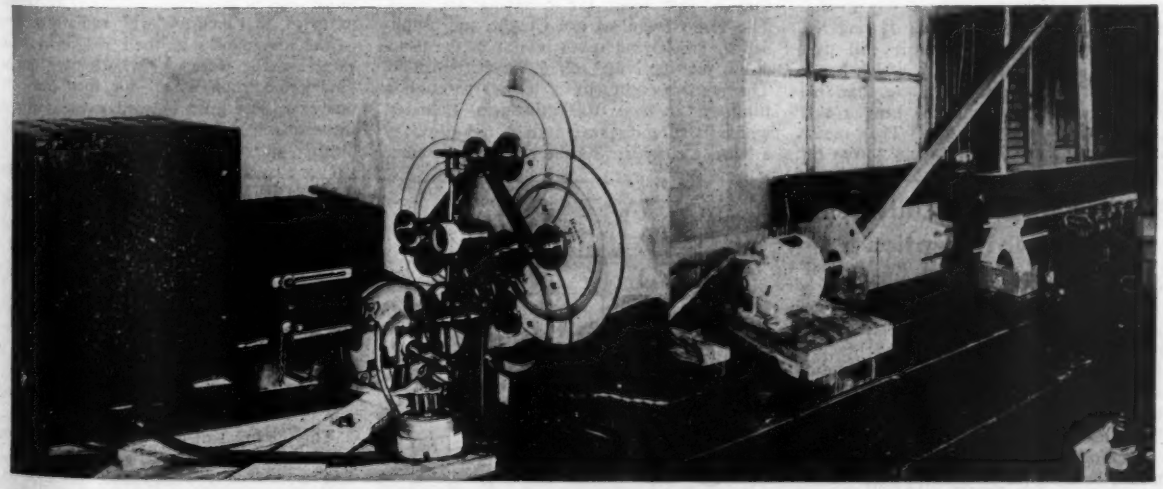
The four rotating prismatic rings, and the picture-illuminating lantern of the radio photograph transmitter

is made to a thickness of half an inch when the point A is reached again.

The result is that, if the disk is thought of as lying flat, there is a bevel of the two-inch band at the point A slanting downward from the outer edge toward the center, which bevel grows less as you pass around the disk until it disappears entirely at the half-way point, where the glass is of the same thickness at the outer and the inner edge. Then a bevel in the opposite direction appears, that is, sloping upward from the outer edge toward the center of the disk, and this increases over the other half of the disk's circumference until we are back again at the starting point A. This progressive change in thickness at all points of the two-inch band gives a continuous prism which has a constantly changing angle of deflection.

When the light ray passes through this outer edge of the prismatic ring, say at the point A, it is deflected considerably from the straight line it would otherwise follow. But if the disk is slowly revolved, the deflection is less and less until it vanishes entirely and the ray takes a straight course. This happens when the disk is turned half way around. Then the deflection begins again but in the opposite direction, and continues until the disk has turned completely around. During the whole revolution the ray has been deflected through an arc of about 7 degrees. The position of the disk naturally determines the direction of this deflection, but as Mr. Jenkins now has his machine adjusted the light ray is bent downward at the point A, comes to the horizontal when the disk is turned half way around and is bent upward at the end of the complete revolution. It is obvious that if the light ray falls on a screen it will move steadily upward as the disk is slowly turned, and if the disk keeps revolving there will be a succession of these upward movements from the bottom to the top of the screen, one for each full turn. If instead of a light ray we have a photographic image it will likewise move upward across the screen time and again, and if the disk is revolved rapidly there will be a quick succession of these upward strokes. As it is run at present the photographic image sweeps upward about twenty-five times a minute. By a further elaboration of this continuous-prism principle Mr. Jenkins is able to get two full strokes of the light ray or image with each revolution of his prismatic ring.

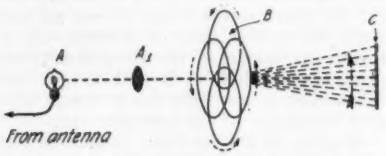
In place of a screen Mr. Jenkins sets in the path of the image a long, square, light-proof box, in the end of which is a small aperture of about a sixteenth of an inch. In the box some eight or ten inches from the aperture is a light-sensitive cell or button, half an inch across, which was formerly made of selenium but which is now made of a composition fused of thalium oxide and sulphur. The electrical resistance of this button is greatly reduced when light strikes it, falling from 50,000 ohms in the dark to about 5,000 ohms in the strongest light used in the machine. A weak current is passed through this button, and as the



Apparatus used in transmitting photographs by radio. At the left is the lantern for illuminating the object to be photographed, with the prismatic plates; at extreme right is the long black box containing the light-sensitive cell; between the two is the chopper

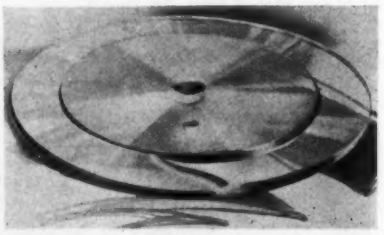
motion of the revolving prismatic ring sweeps the photographic image across the aperture the light and dark places on the image will cause the current passing through the button to grow stronger and weaker. These delicate variations are amplified by being passed through a set of amplifying tubes of the ordinary radio outfit and then to the antenna which broadcasts them in the same way in which sound waves are broadcast. In order to obtain the oscillations necessary for sending out the wireless waves Mr. Jenkins places in front of the aperture a swiftly revolving metal disk about a foot across, in the outer edge of which is a row of round holes half an inch or so in diameter. The disk is placed so that the circle of holes turns directly in front of the aperture and the ray of light shining into the aperture finds itself constantly cut off and renewed, at the rate of 540 times a second. This rapid "chopping" gives the necessary uni-directional pulsating current for producing the radio waves.

It is easy to see how by this method impulses can be sent out which will reflect accurately the gradations of light and dark which enter the aperture when the photographic image is swept across it once. But this represents only a single stroke or line across the picture. In order to get the whole picture Mr. Jenkins sets another of his prismatic rings so that its edge over-



A—Bulb with fine tungsten filament heated to a red glow, through which radio impulses pass. A_1—Lens
B—Set of prismatic rings similar to, and synchronized with, those in sending set
C—Photographic plate

laps that of the first, but in such a position that the light ray, in passing through its outer edge, is bent at right angles to the direction in which the first ring deflects it. For instance if the prismatic effect of ring No. 1 is to cause the ray to vary from a straight line in an up-and-down direction that of ring No. 2 is to bend it from left to right, or vice versa. Ring No. 2 is then made to revolve very slowly so that each time a complete revolution of ring No. 1 sweeps the image upward it will pass through a part of ring No. 2 which has a slightly different deflection angle than before, and will accordingly be bent a tiny bit farther, say, to the right. That means that every time the image sweeps across the aperture it will be moved a little farther over than it was before, and a different line of light and dark will fall on the sen-

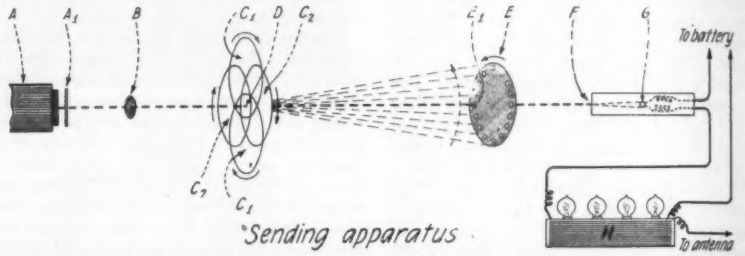


One of the prismatic discs, showing the tapering bevelled edge

sitive surface of the button and be recorded in the radio waves. As at present adjusted the sending machine registers 102 of these lines to the inch of photograph, or about the same as is found in a half-tone screen of medium fineness. It should also be stated that in his present apparatus he finds it necessary to use two pairs of rings instead of two rings, in order to correct an optical error which is inherent in the form of the plate.

It is clear that if a receiving instrument could catch the radio impulses which result from each of these successive lines of light and dark as they come through the air, and could convert them again to lines of light and dark, and if these lines could be set side by side, a picture could be built up precisely like that of the original. And that is just what the receiving set does. The radio impulses are caught and amplified by amplifying tubes just as in the usual outfit for receiving sound waves by radio. The resulting current is passed through a tungsten filament 0.0006 inch in diameter, which is already heated to a red glow by a battery current. As the radio waves come over stronger or weaker with the variations of light and dark in each line sent out by the sending apparatus, the light in this bulb glows out more brightly or sinks down. This light is sent through a lens and then through a set of prismatic rings which are revolving in exact synchronism with those of the sending apparatus, and then on to an exposed photographic plate or film. The whole process of sending and receiving is thus as follows: When the image in the sending apparatus sweeps across the aperture once, the gradations of light and dark are transformed into stronger and weaker radio waves, these into stronger and weaker electrical currents in the receiving apparatus, these again into brighter or duller variations of light in the receiving bulb, and these again into a line of lights and darks on the receiving photographic plate. As these lines range alongside each other the areas of light and dark are massed, just as in the original, and a picture is built up similar to that original and having all the detail of the half-tones used in newspapers.

For synchronizing the movements of the prismatic rings in the sending and the receiving sets Mr. Jenkins has made use of an ingenious device consisting of a large tuning fork on the transmitting set and a similar one at the receiving end. Each of these tuning forks is kept in vibration by its own battery, and has a make-and-break connection with the motor which runs the prismatic rings.



A—Projecting machine. A_1—Slide. B—Lens. C_1—Prismatic rings which in revolving sweep the image in an upward arc as indicated. C_2—Prismatic rings which revolve slowly and cause the image to move slowly from left to right. D—Point through which light passes, at intersection of the four rings. The prismatic rings and "light chopper" are circular but are here drawn as if viewed at an angle. E—Swiftly revolving "light chopper." E,—Point at which light passes through holes in edge of the chopper. F—Aperture. G—Light-sensitive cell. H—Amplifying tube

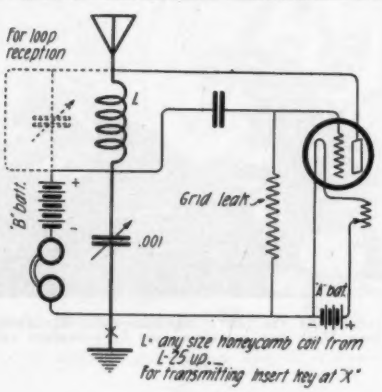
Mr. Jenkins looks forward to the time, at no distant date, when half a dozen or more big broadcasting stations in various parts of the country will radiate pictures to the newspapers in their respective fields, receiving the pictures perhaps over the ordinary telegraph wires—for they can obviously be sent just as well over a wire as by wireless, since they depend primarily on electric current.

Simple Circuit for Universal All-Wave Reception

IN the accompanying diagram George C. Haseltine gives a circuit, which, while easy to construct is stated to be quite efficient on all wave lengths.

It is somewhat similar to the ultra-audion circuit and also similar to universal circuits previously published in THE WIRELESS AGE.

This circuit, in addition to being efficient in reception on practically all wave lengths, can also be used for transmitting over short distances, by inserting a key in the ground lead.



Mr. Haseltine makes no claim of originality in submitting this circuit to the readers of THE WIRELESS AGE for as he states, it is fully explained on page 232 of "The Wireless Experimenters Manual," by E. E. Bucher. Mr. Haseltine's reason for submitting the article was to call attention to a satisfactory circuit for universal use which is not difficult to assemble and which is easily manipulated and at the same time stable and efficient in operation.

This circuit can also be used with a loop, in place of the antenna, ground and Coil L and some really remarkable distance records have been made with this loop-circuit arrangement.

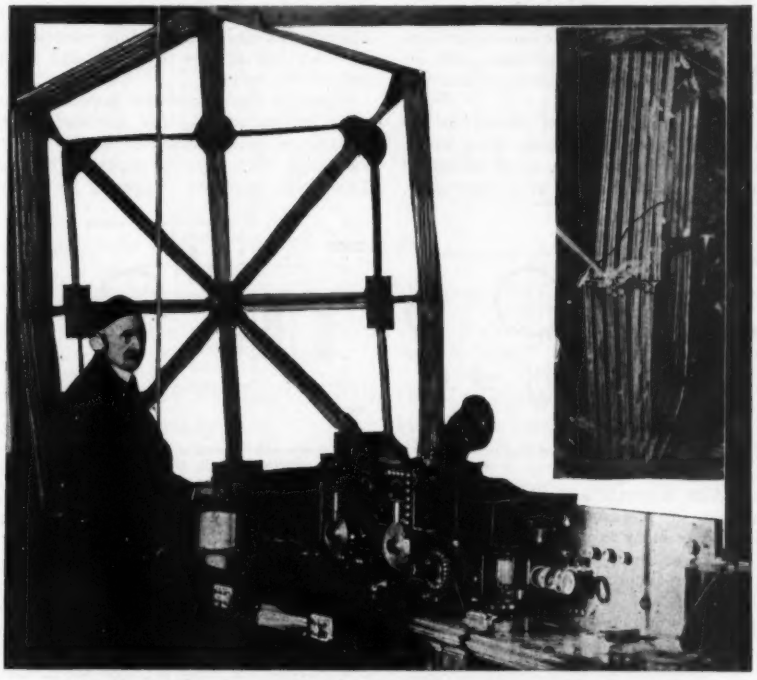
Burying the Antenna in a Well

By S. R. Winters

IT is the conventional way to perch the loop aerial on a pedestal or table, but Dr. J. Harris Rogers of Hyattsville, Maryland, is able to intercept electromagnetic waves when his loop antenna lies in an old well. The aerial thus buried, however, is of unique design and perhaps its construction is responsible for its effectiveness when planted beneath the surface of the earth.

Antennas taking the forms of cages and loops differ in their structural features and in receiving electric waves are units within themselves. The newly designed aerial of Dr. Rogers, however, appears to have combined the characteristics of both the loop and cage forms of antenna. The oddity of the formation of this 6-foot square loop aerial justifies the inventor in making application for a patent covering the construction. This device is composed of six convolutions of wire, each convolution resolving itself into a miniature cage antenna. Eighteen fine wires constitute the cage, and the different cages are divorced from one another by one inch of space. Another unit built by Dr. Rogers, conforming to the principle just outlined, but differing slightly in size and formation, consists of a loop aerial seven feet square. Each miniature cage is composed of 24 wires instead of 18. The spacing between the individual cages of both of these loop aerials is the same, one inch. Both operate on the same wave length, although the frame of one is larger than the other.

A reduction of the high-frequency electric resistance and the elimination of some of the interference from local stations, are among the outstanding virtues of this new type of aerial, which has unified the structural characteristics of the loop and cage forms of antenna. When operating in conjunction with the "JM-6" amplifying wireless receiving outfit, a product of Brent Daniel, Washington, D. C., reception of radio communication is possible from such distant transmitting points as Chicago, Milwaukee, Davenport, Ia.; Louisville, Ky., and towns in Tennessee. During the "listening-in" period of one evening a concert being broadcast from a station in Havana, Cuba, was heard at Hyattsville, Maryland, by use of this 6-foot loop aerial. When buried in a well this form of antenna functioned quite as effectively as when mounted on a table in the laboratory of the Hyattsville inventor—the two locations are shown in the accompanying photographs.

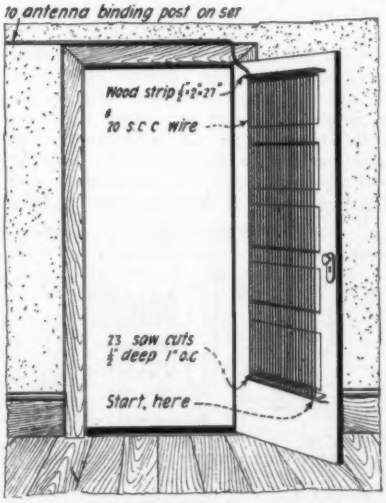


Dr. Rogers using the conventional loop; inset shows loop installed in a well

A Novel Indoor Antenna

By Max Abel

MUCH has been written about directional effects of loops on receiving sets but even these may be in the way in apartment houses in which the rooms are small and well filled with furniture. A Washington radio enthusiast feels that he has solved this problem by constructing an antenna on the inside of a closet door. In a nutshell this is done by simply fastening a strip of wood with 23 saw cuts in it, one inch apart, at top and bottom of the inside of the door and winding No. 20 single cotton-covered wire from top to bottom as shown on the accompanying diagram. The wood strips are made of half-inch stuff, 2 inches wide and 27 inches long. It is necessary to start the winding at the outside edge of the bottom strip so that the last winding will bring the free end out at the inside of the upper strip. Plenty of slack should be left in this free end to connect to the wire running to the antenna binding post on the set or it may be suitably connected to a plug or switch set in the wall.



In actual operation it was found that there was considerable directional effect when used in connection with distant stations, and to overcome body effect a spring was fastened to the door so as to keep it closed and a small stout cord tied to the door knob permitted the operator to pull the door around as far as he chose so as to bring in the station most clearly.

Another stunt that may be used in apartment houses where metal lathing has been installed is to run a screw through the plaster in an inconspicuous place so that the screw makes good contact with the lath. To this is fastened the antenna wire.

Both of these ingenious "aerials" have successfully brought in outside stations at Washington, some of them being as far away as WDAP Chicago, and WOC Davenport, Iowa.

Auto-Coupled Reception Circuits

By S. Hamilton

WITH the summer time vacation set problem in mind, I have succeeded in producing an auto-coupled circuit which I have called the counterpoise system of reception, that should meet with the approval of both the radiophone fans and the telegraphy amateurs.

Figure 1 shows a typical circuit, the departure from the usual circuit being in the common battery connection, which instead of going straight to ground, as is customary,

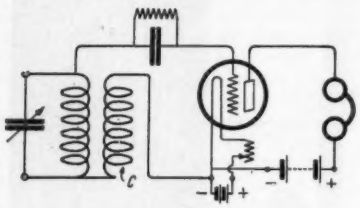


Figure 1

Typical auto-coupled receiving circuit

first passes through an inductance which is placed in inductive relation with the aerial, or primary coil.

The A battery connection may run straight to ground as usual with the negative lead of the B battery only passing through this counterpoise coil before joining the A battery, or the negative of the B battery may pick up the ground connection with the A battery lead passing through the counterpoise coil, results being obtained with either arrangement although both battery leads passing through the coil appear to give the best results. It is advisable however, to try each arrangement and choose the one that gives the best results for particular conditions.

This counterpoise system is absolutely universal and is adaptable to any circuit. It is not necessary to make any radical changes in an existing set and as a further advantage it may be made as a separate external attachment to any set, the only material required being a variometer, or the usual standard coupler.

Keeping in mind an existing receiving set I will attempt to make the counterpoise attachment applicable to your particular set. The three coil honeycomb or spider web being the most popular will be first considered. Figure 2 shows the three coils, primary coils and tickler being left intact and the change made in the secondary, or middle coil. The drawing pretty well explains itself, the only precaution being to reverse the connections to the middle coil. The counterpoise coil is here shown in the middle although any combination may be adopted, primary in the middle, counterpoise on either one side or the other and tickler coil in the middle.

Figure 3 shows another popular circuit using the variocoupler and two variometers the changes being made only in the coupler, the dotted lines showing suggested changes. This circuit need not necessarily be used as

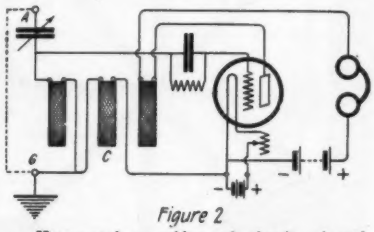


Figure 2

Honeycomb or spider web circuit. A and G shorted. C is the counterpoise coil

it is shown, but the reader is advised to try one of the dotted connections first, then disconnect and try the other.

Figure 4 is the typical Reinartz circuit, the addition being the counterpoise coil which if desired may be arranged to slide inside the primary coil keeping in mind to reverse the connections to the counterpoise coil. There are many users of the Reinartz

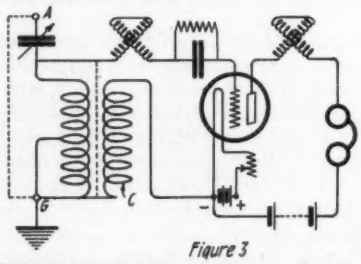


Figure 3

Variocoupler and variometer circuit. A and G shorted. Dotted lines suggested changes. C counterpoise coil

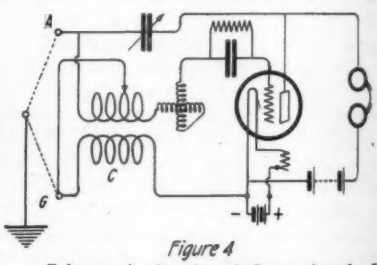


Figure 4

Reinartz circuit. A and G not shorted. C, counterpoise coil

circuit who have made a slight departure from the circuit shown on Figure 4, but the counterpoise coil is still applicable as shown.

Figure 5A is the now popular Flewelling circuit and is the last circuit I have tried out with the counterpoise, the variation being in the additional coil which is shown in the circuit after the condensers. The same combination as in figure 1 may be tried out by placing the counterpoise coil either in center or opposite ends. I have tried the counterpoise coil in various positions in the "Flew" circuit such as before the condenser and after it on the ground side and in the common battery leads before they pick up the condenser. This is shown in figure 6 and appears to give the best results.

This counterpoise system may be used as an external attachment so that the wiring of a set may not be disturbed except for the common battery lead or the other arrangement shown in figure 7 where nothing inside of the cabinet need be disturbed.

In figure 6 is shown a receiving set. Obtain a variocoupler or a variometer which should be split to function as a coupler. Connect it as shown in figure 6A and B. The only wire in the set which need be disturbed is the common battery lead which is disconnected from its original position and passed through one of the coils, the other side of this coil going to the connection to which the battery lead was attached or else straight to the ground binding post.

Figure 7 is another arrangement where nothing whatever behind the panel need be disturbed.

Another method is to wind a coil of about 30 to 50 turns on a form that will either slide inside or over the primary coil connecting the battery lead to one side and the other side to the primary on the ground side. If a series condenser is in use in your circuit your A and G binding post should be shorted.

As I have already mentioned I was working up a portable set for vacation use so I confined my experiments on the counterpoise system to dry battery tubes, resulting in a cabinet 7 x 7 x 7 inches containing detector and two steps and all batteries with single control, all tuning being done with a 23-plate condenser. No rheostats were used.

To obtain the single control I tried out

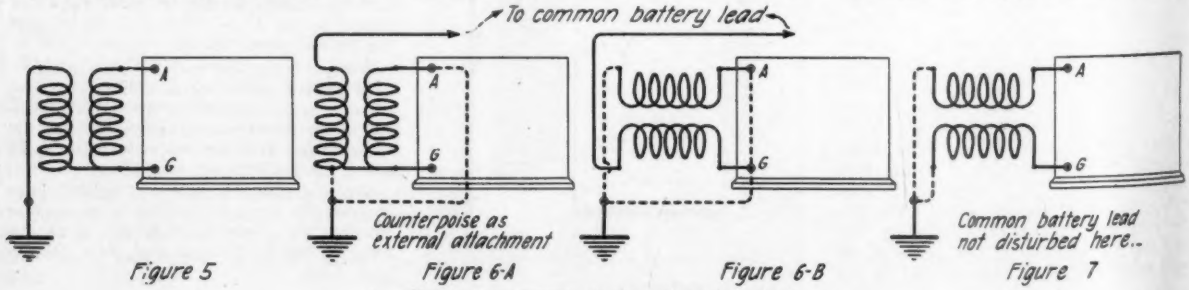


Figure 5 Figure 6-A Figure 6-B Figure 7

Various arrangements of the auto-coupled circuit

several single circuit arrangements choosing the circuit that gave the largest range of control with the condenser only, the inductance kept in a mean fixed position. The circuit decided upon, the counterpoise coil was introduced and was arranged to pick up the mean position having a suitable range on either side. This position was about at right angles to the primary and here the counterpoise coil was fixed. Two honeycomb or spider web coils will answer the same purpose.

The various circuits submitted in this article have all been tried with the counterpoise attachment and are not merely suggestions. Each circuit in turn came up to expectations. On detector alone using the variocoupler, variometer circuit, Memphis, Tennessee was heard.

The relation of the counterpoise coil to the aerial circuit is very similar to the outside counterpoise aerial and the same theory appears to be applicable. With the counterpoise coil system we can obtain the counterpoise effect right inside the cabinet which is a decided advantage when the cost and labor of the outside counterpoise is taken into consideration. To fully appreciate this circuit it should be tried out on a night that static is bad.

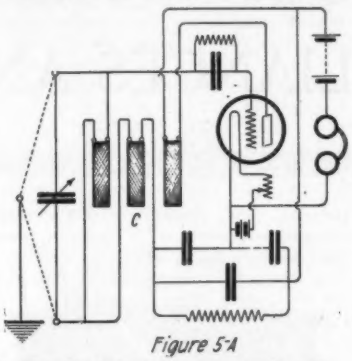


Figure 5-A

The Flewelling circuit. C_1 counterpoise coil

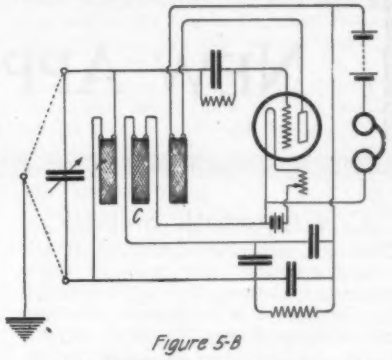


Figure 5-B

Flewelling circuit. C_1 counterpoise coil before the condenser bank

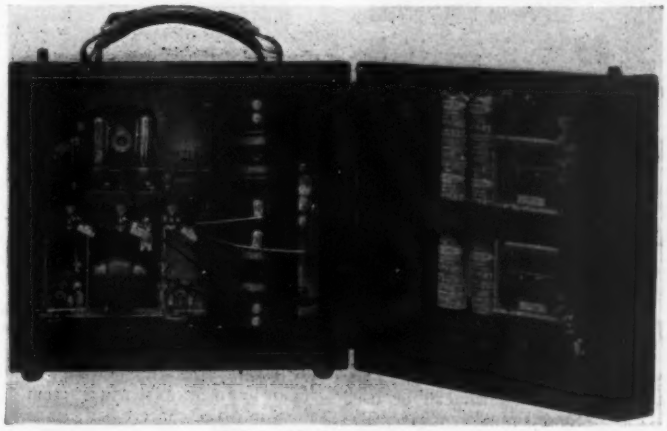
A Portable Receiver, Using Flashlight Filament Batteries

A COMPACT, self-contained portable radio receiving set, which can be carried as easily as a suit case, which requires only flashlight batteries for the filaments of the tubes and which weighs less than 18 pounds, has recently been developed by the General Electric Company for the Radio Corporation of America. An outstanding feature of this set, which adds to its portability and desirability for camping trips, is the fact that the new radiotrons, UV-199, which require only 60 milliamperes (.06 amperes) filament current per tube, are

This new outfit, known as the Radiola II, will receive radio messages over a range from 200 to 600 meters for a distance as great as any set having a detector and one stage of amplification. It is housed in a mahogany cabinet with hinged front and rear covers. Head telephones, with plug attached, are clamped on the inside of the front cover. Provision is made in the rear cover for batteries in such a way that they can be easily exchanged.

The set is so designed as to make a neat appearance in the home. The front cover can be easily detached.

Radiola II comprises a regenerative receiver with a vacuum tube detector and one stage of audio frequency amplification. The circuit is very efficient and will operate a loud speaker on signals received from nearby stations. With an additional amplifier, it can be used to obtain loud speaker signals from distant stations.


Radiola II—Open rear view

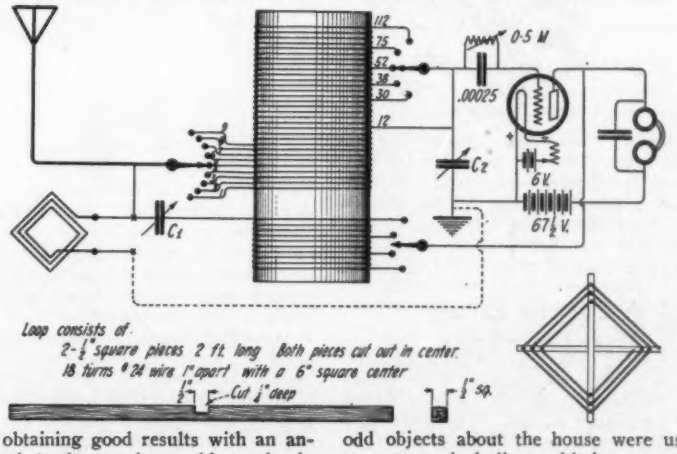
For portable use, the filament current is supplied from two 3-cell 4½-volt flashlight batteries in parallel, and the plate or "B" battery current is supplied by two 22½-volt batteries connected in series. For home use, when weight and portability are not essential, larger batteries both for filament and plate current can be used. For such use it is recommended that three 1½-volt dry cells in series be used for the filament and two larger size 22½-volt batteries in series be used for the plate voltage.

"How I Rolled My Own"—By W. M. Mace

HAVING read a great deal about the Reinartz tuner, I decided to give it a try. I bought a spiderweb coil, but it must have had holes in it somewhere, as all the high-frequency currents leaked off. After trying another one, with the same results, I decided to roll my own. Since completing this coil I have obtained excellent results with the receiver shown in the accompanying diagram.

The coil shown is wound on a cardboard tube, 3½ inches in diameter and 6 inches long. The primary winding is tapped every turn up to the eighth and is connected to the antenna by a switch. The 12th turn is connected to the positive side of the filament and to ground. The primary is also tapped at the 30th, 38th, 52nd, 75th and 112th turns, to which the grid is connected by means of a variable contact switch.

This set will tune to 700 meters and during good conditions stations 1,000 miles away have been heard clearly, while using a regulation antenna and ground.



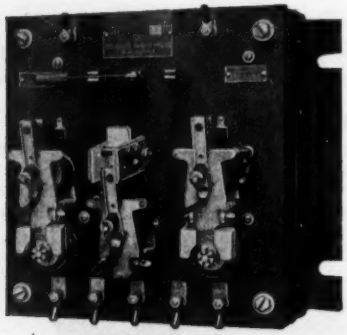
After obtaining good results with an antenna, I tried a loop and was able to clearly hear all nearby broadcasting stations.

Other arrangements were tried, in which odd objects about the house were used as an antenna including a kitchen stove, bedspring and water pipes, with a fair degree of success.

NEW APPLIANCES AND DEVICES

C-H Automatic Starters

FOR the automatic starting of electric motor-generator sets used in Radio Broadcasting stations, The Cutler-Hammer Mfg. Company of Milwaukee, has developed a starter designed especially for this service.



The Cutler-Hammer starter

This consists of a panel carrying one magnetic main switch and two C-H Magnetic Lock-Out Contactors for cutting the starting resistance out of the motor circuit during the acceleration period. A push button may be connected in the magnet circuit of the main switch and located wherever convenient to the attendant.

Universal Bradleystat

THE Allen-Bradley Co. have recently placed on the market a new model of the well-known Bradleystat which can be used with all detector and amplifier tubes. The new model, known as the Universal Bradleystat with three terminals, provides extremely wide range of control in three ranges

The universal Bradleystat

obtainable by using the proper pair of terminal connections. By means of the new Universal Bradleystat, one rheostat can be used for all tubes. The use of scientifically-treated discs enables the Allen-Bradley Co. to guarantee the Universal Bradleystat to give perfect filament control for all tubes.

A Cabinet Outfit

THE Radiopera cabinet outfit shown is now being offered to the trade by Lyon & Healy. This is a complete radio installation enclosed in an especially designed brown mahogany cabinet. The outfit contains a Westinghouse R. C. Receiver, Western Electric loud speaker, Willard rubber encased "A" battery, Tungar battery charger, and Burgess "B" battery, complete with antenna and accessories.

A disappearing door permits free passage

The Radiopera cabinet

of the sound waves from the horn of the loud speaker. Panel doors, both in front and in back, give easy access to all parts of the radio apparatus to facilitate the adjustment of wire connections. The outfit is an economical one to operate. It is compact and a very handsome article of furniture.

The radio store listens in on daily concerts held in the Lyon & Healy concert hall. As a result one may compare the voice of the singer with the reproduction of it by radio by merely stepping from the radio store into the concert hall.

B-Metal "Super" Crystals

THE B-Metal crystal is being marketed by the B-Metal Refining Co. This crystal has been slow in reaching the general field due to the limited output being absorbed locally. Detroit alone in three months called for more than 40,000 B-Metal Crystals.

B-Metal is a name adopted by the makers to designate a manufactured product of

The B-Metal crystal

exceptional merit as a rectifier of radio waves. Its peculiar claim is that it increases volume, and distance of audibility and is sensitive over practically its entire surface. It is well presented as to appearance, being more like a piece of jewelry than what one has been accustomed to see in a radio crystal.

B-Metal products, including a permanent detector, also a semi-fixed type are sold under the broadest possible guarantee by the makers.

Crosley Sockets and Rheostats

THE Crosley Manufacturing Company has put a new type of tube socket on the market in addition to the porcelain type. The new type socket is made of moulded insulated material. Both these sockets are made in one piece. The contacts are of special, strong phosphor bronze, nickel plated, to eliminate to a great degree corrosion at the contacts. The nuts and screws are brass, nickel plated.

Both models of the Crosley V-T Socket are designed to prevent short circuiting of

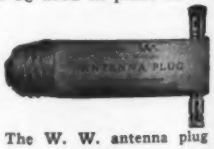
The Crosley rheostat and socket

high voltage "B" battery current across the filament contacts, thus eliminating the danger of burning out the filament through careless inserting of the tube. Crosley V-T Sockets may be mounted on a base or panel.

Considerable improvement has been made in the Crosley rheostats, which permit exceptionally accurate and delicate variations of the filament current. They can be furnished wound for 20-ohm resistance for use with 201-A, 301-A or the 199 General Electric tubes. The Model B-6 is encased in a covering of insulating material which prevents possible loss of shape and the resultant loose contacts. This covering has high thermal characteristics. A special grade of non-corrosive wire forms the resistance. Newly designed knobs are used. These are designed to permit mounting on a panel of any thickness up to and including three-eighths of an inch. The overall diameter is 1⅝ inches, resistance is six ohms and they will carry one ampere.

W. W. Antenna Plug

THE W. W. (Wired Wireless) Antenna Plug is a new product which has recently been placed upon the market by the W. W. Manufacturing Company and which can be used in place of the ordinary



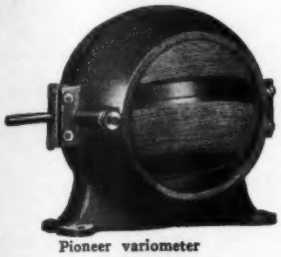
The W. W. antenna plug

outside aerial or antenna by merely screwing it into the ordinary lamp socket.

It eliminates danger of fire and also the cost and inconvenience of constructing an outside aerial. The particular feature of this plug is its simplicity of design.

Variocoupler Resembles a Variometer

A NEW variocoupler, which is inside wound, on the same general lines as the variometer, is being marketed under the name of Pioneer. In appearance this variocoupler resembles a moulded variometer except for the presence of taps attached to the stator. The Pioneer variocoupler is made of moulded bakelite. A large size of wire and the close coupling that is possible between



Pioneer variometer

Pioneer variocoupler

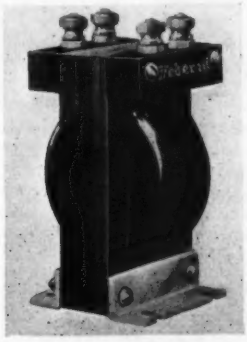
the two wirings reduces radio energy resistance to a minimum. The relative position of rotor and stator is maintained positively by a cone-shaped self-centering bearing. Contacts are of the riding-spring type. There is a Pioneer variometer to match this variocoupler, so that the conventional variometer and variocoupler hook-up may be put together by the use of apparatus of the same make. Both instruments are exceedingly attractive, the bakelite shells being given a Circassian walnut finish. The wire is covered with green silk and the metal parts are nickel-plated brass. The wave length ranges of these two instruments are 150 to 750 meters.

New Federal A. F. Transformer

THE No. 65 audio frequency transformer recently developed by the Federal Telephone & Telegraph Company, has been designed to faithfully reproduce the beauty and quality of the tones of the artist or instrument. Its design and construction is of such a nature that the notes of the bass viol, the kettle drum and the piano bass are faithfully reproduced.

The actual production of the means for preserving the full tones of good music through the presence of the lower tones opens up a new and more serious problem than even the determination of what makes music reproduction satisfactory. There seems almost to be a conspiracy on the part of nature to make this difficult, if not impossible. In transmission of music by radio this is easily evident. The more usual forms of voice converting equipment sometimes neglect the lower tones, and while the very high tones may not be emphasized, they are invariably reproduced with greater intensity than are the very low tones. In the reception of the music the same loss of the lower tones and the over emphasis of the higher tones occurs again. Here again the amplifiers frequently neglect the bass and emphasize the upper register and here, perhaps, lies the greatest cause for dissatisfaction with the radio music.

The methods for the elimination of these many difficulties lie in the careful design of an amplifying transformer. The matter is one that requires the greatest possible care in choice of proportions, nature of the materials involved, and their careful fabrication and assembly.

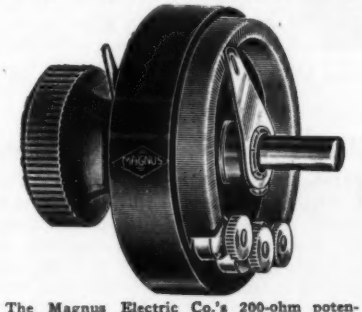


Federal A. F. transformer

The No. 65 Federal transformer is of such construction that each note that enters it is passed on to the following vacuum tube with exact fidelity. This new transformer is well suited to any of the standard amplifying tubes now on the market.

200-Ohm Potentiometer

THE Magnus Electric Company has recently put on the market a new type of potentiometer for use in radio frequency circuits for stabilizing purposes and also for regulating the plate voltage of soft



The Magnus Electric Co.'s 200-ohm potentiometer

detector tubes. The potentiometer has a maximum resistance of 200 ohms, and in the case of a 22½ volt B battery will allow of any variation between 16½ and 28½ volts when connected across the A battery, with the negative B battery lead connected to the middle post. When used in radio-frequency circuits for stabilizing purposes it is connected across the A battery, with the center post connected to the filament, or grid returns, of the radio-frequency tubes.

The Warren Radio Loop

A NEW type of radio loop, known as the Warren Radio Loop, has been developed by the Ve-De-Co. Radio Mfg. Co. It makes any set portable by fitting neatly inside or setting on top of the cabinet. This type can be used, with or without a ground connection. Ground connection can be made either direct or indirect from a binding post on the loop to the metal frame of a combination gas and electric fixture, the metal part of a desk telephone set, a gas pipe, a steam or hot water radiator, a water pipe, metal frame of auto, or other similar ground. Although this ground connection reduces the directive qualities it greatly increases the strength of the incoming signals. Within 5 or 10 miles of a broadcasting station, this Warren loop will pick up the programs excellently without any ground connection. Stations in Philadelphia, Newark, New York, Ridgewood, L. I., and Schenectady, N. Y., are clearly heard in Asbury Park on a standard single tube set using this small, six-inch Loop Aerial. With the same aerial, a set employing a detector and two steps of audio amplification with a Magnavox Loud Speaker, has produced signals from all these stations loud enough to be heard all over a three-story house.

Exceptional results are obtained with this type loop by connecting the loop, shunted by a small variable condenser, directly to grid and filament of the amplifier and detector tubes, with no other tuning devices. All tuning is accomplished with the variable condenser, the whole operation being very simple. It is surprisingly selective, enabling the operator to shift reception from one station to another, provided there are but a few meters difference in the wave lengths.

A loop requires finer tuning adjustments than an outdoor aerial but gives finer signals with a consequent reduction of, and frequently entire elimination, of interference. Static is also greatly reduced.

Three-Stage "Symphony" Receiver

THE Jones Radio Company has put on the market a standard receiver of high selectivity and extreme simplicity with a wide range of reception. It is known as the "Three-Stage Symphony Receiver."

The Three-Stage Symphony receiver

Du-Tec Is Synthetic

LOVERS of the clear distortionless tone of the crystal detector will be interested to know that the Dubilier Condenser & Radio Corp., has succeeded in devising a synthetic material to take the place of the natural crystals commonly used for detection. The Dubilier Company is now marketing this material under the name of Du-Tec, and claims for it freedom from the annoying characteristics of the natural crystals, such as spotty sensitivity and liability to oxidize. Tests have shown that the new synthetic rectifier does not change over long periods of time, retaining its maximum sensitivity over practically its entire surface. Users find that searching for a sensitive spot is unnecessary.

INDUSTRIAL INKLINGS

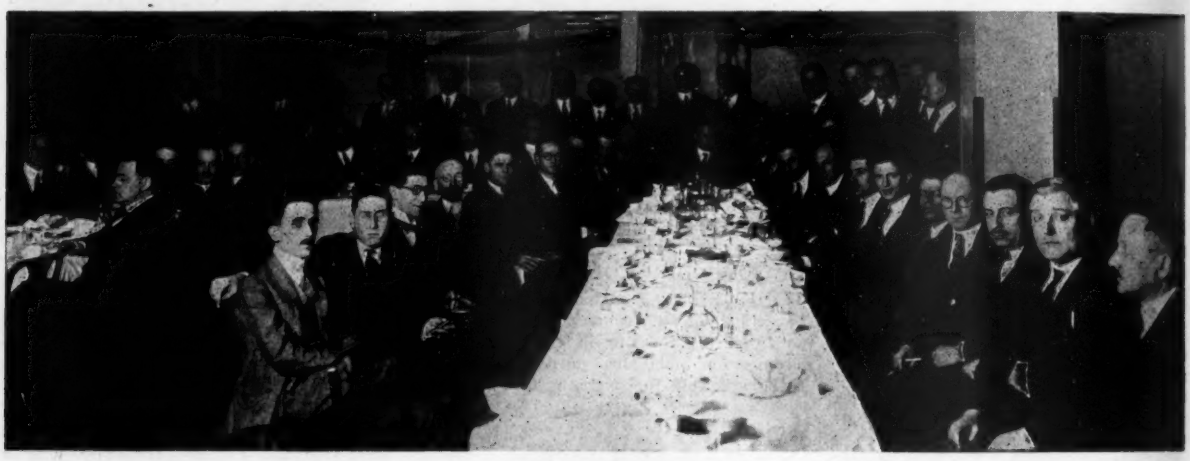
Joint Meeting of Radio Manufacturers and National Radio Trade Associations

OVER sixty representative manufacturers and jobbers of radio equipment heard C. B. Cooper, eastern representative of the Crosley Manufacturing Company, a member of the Hoover Committee, explain the close co-operation that can be expected from the Government in radio matters at a joint meeting of the Radio Manufacturers Association of New Jersey and the National Radio Trade Association held at Newark, N. J., recently.

Mortimer Saltzman, of the Wholesale Radio Equipment Company, Newark, spoke on the subject of confidence. Arthur H. Lynch of Radio Broadcast spoke of the possibility of increasing sales by pushing complete sets.

Herman Rose of the Shamrock Manufacturing Company was the last speaker, warning those present of the danger of inferior imitations of standard merchandise being placed on the market.

The attendance at this meeting points out the intense interest shown among manufacturers in the New Jersey territory and speaks well for the progressiveness of the members of the New Jersey Association.



Some of the representative manufacturers and jobbers who attended the joint meeting of the Radio Manufacturers and National Radio Trade Associations

W. S. Lefebre, president of the New Jersey association presided.

H. C. Gawler of the Radio Corporation of America and W. E. Harkness of Station WEAF, American Telephone and Telegraph Company spoke. Mr. Harkness explained the work his company is doing in experimenting to find out exactly what can be broadcast and will be listened to by the fans. D. W. May of Station WBS, Newark, explained matters in regard to the demands of the Society of Authors and Composers.

L. A. Nixon, secretary of the Radio Trade Association, reported on the work that organization is doing among newspapers and lightning arrester manufacturers to prevent a recurrence of last summer's fear campaigns. He also introduced H. L. Levy of the National Drug Stores, New York City, representing the recently organized Radio Dealers' Association of New York.

Mr. Levy explained in detail the steps his organization is taking to correct some of the evils among retailers and offering protection to the consumer.

Class in Radio Merchandising

THE Y. M. C. A. Radio School, 153 East 86th Street, New York, is preparing to establish a class in Radio Merchandising. This course will be planned especially for the small radio dealer and the newcomer into the radio retailing and merchandising field. It will consist of fifteen sessions and the class will meet two or three evenings a week. Organizing and planning the radio store will be fully covered. The training of radio salesmen, the establishment of amateur club rooms, the demonstration of a radio set, dressing the radio store window, financing the radio store, selecting radio stock and many other phases of the radio business will be included.

The course will be short, making it possible for the busy radio clerk or business man to find time for attendance. An important feature is that entrance may be made at any time, the lectures and practical demonstrations being so arranged that it will be unnecessary to start at the beginning, and perfectly practical to accept a student even though part of the course has been covered. A staff consisting of some of the most experienced radio men in New York will be in charge. The tuition rate will be very moderate and the full machinery of the Y. M. C. A. organization will be available to any student who wishes to take advantage of the privileges. All inquiries should be addressed to Arthur R. Nilson, Department of Education, East Side Branch Y. M. C. A., 153 East 86th Street, New York City.

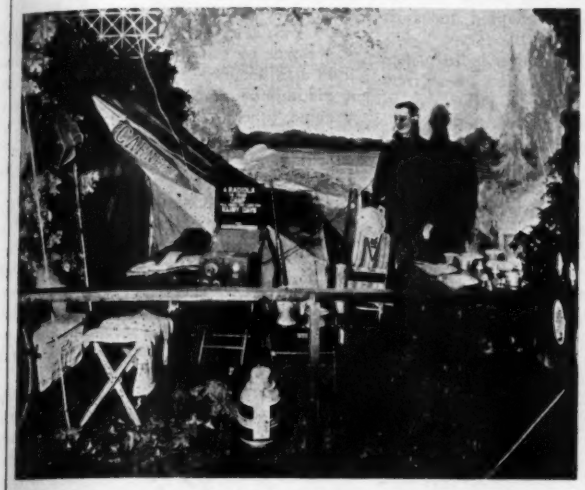
Westinghouse Sales Jump $25,000,000

THE net income of the Westinghouse Electric & Manufacturing Co. for the year ending March 31, 1923, was $12,263,485, as shown by the company's annual report. The dividend requirements were $6,033,428, so that over twice this amount was earned and more than six million dollars added to the surplus. Gross sales for the year were $125,000,000, which represents an increase of $25,000,000 over the sales of last year. The cash position of the company is a strong one, the current assets totaling over $106,000,000, and the current liabilities less than $17,000,000.

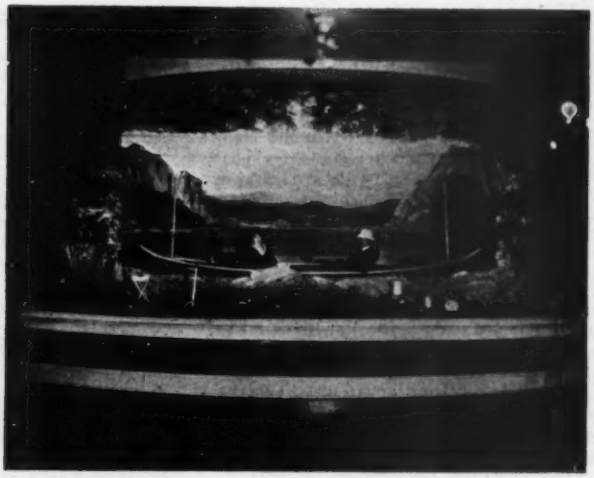
"The bookings of new business steadily increased during the year," states Guy E. Tripp, Chairman of the Board of Directors, "and the value of unfilled orders at the close of the year was $61,914,237, as compared with $50,740,696 at the close of the previous year."

A plant located at Sharon, near Pittsburgh, Pa., was acquired during the year, and it is planned to concentrate the manufacture of transformers there. Two hundred dwelling houses, located near the company's South Philadelphia works and formerly the property of the Emergency Fleet Corporation, were purchased and are being sold to employees.

Modern sales methods employed by live radio dealers include more than a mere display of apparatus



A Radiola in your camp will make you long for rainy days



Outdoor life with a Radiola along means that you will never be at a loss for something to do

A Receiving Set in a Glass Case

JOHN GRAVES, of the French Battery and Carbon Company, has conceived and built a radio receiving set of glass with two steps of audio frequency. The set operates with three WD-11 tubes on a Number 1261B Ray-O-Vac "A" battery and three No. 2151 Ray-O-Vac "B" batteries on the plate circuit.

This unusual set of glass is the eighth radio set Mr. Graves has built. The idea for the building of his glass set springs from Mr. Graves' association several years ago with a business in Milwaukee which made glass window display fixtures. "It was while attempting to cut down the expense of drilling holes through the plate glass used in making these fixtures" states Mr. Graves, "that I discovered a solution, through the use of which, I could drill these holes myself without danger of breaking the plates and at one-tenth the previous cost. With my solution, plate glass can be put into a lathe, if necessary and turned without danger of breakage. It holds the edge of the tool to the glass and makes a clean cut job."

There are 54 holes drilled through the glass used in the set varying in diameter from 3-16 to 3-18 of an inch. Each hole required from 10 to 12 minutes for drilling. Ordinary twist drills were used. The set is 26 inches long, 9 inches high and 6 inches deep.

With the set Mr. Graves reports having tuned into more than one hundred and fifty stations, among them being the largest stations in the United States, Canada, Cuba and Porto Rico.

WILLIAM N. SHAW, President of the Eisemann Magneto Corporation, was a passenger on the *Carmania* sailing for Glasgow, Scotland, on Saturday, June 2.

Mr. Shaw will spend several weeks in Great Britain and Continental Europe for the purpose of making arrangements for a distribution of Eisemann Radio Products in foreign countries. Mr. Shaw expresses the opinion that American manufacturers of radio materials of the better grade may expect a growing demand from that quarter for their products.

John Graves and his glass case receiver

ATTRACTIVE and interesting window display by a live radio dealer to create public interest in the ringside description of the various bouts at the boxing carnival at the Yankee Stadium, New York. The ring, the two boxers, the referee and the announcer with his microphone created no end of interest among the thousands of persons who daily passed the store.

International Notes

By CHARLES BAILLY, Paris

THE radio station at Basse Lande, France, is located a few miles from Nantes, where it was placed during the war. At that time, the superiority of its location near the ocean, showed striking results and it has been continuously operated ever since. Electrical energy is taken from the Nantes power supply at 10,000 volts, three phase. A special transformer at the station lowers the voltage to 500, at which tension it goes to the converters. The station having two transmitters, one an arc set and the other using spark, converters are used to transform the three phase alternating current to direct current for the arc transmitter, and to single-phase A.C. for the spark set. It is with the latter that navigation reports are transmitted to small ships furnished with elementary receiving apparatus. The spark set has a power of 140 k. w. and is provided with an emergency transmitter with 30 k.w. power. The arc transmitter has 2 arcs, one of 200 k.w. and the other of 100 k.w.

Radio Telegraphic Stations in France and Algeria Open to Public Service.

	Range Nautical Miles
Algiers	450
Basse Lande (Transmits messages to steamships that are outside the range of coastal stations)	350
Bonifacio	350
Bordeaux	250
Boulogne S'Mer	250
Cherbourg-Rouges-Terres	300
Dieppe	150
Dunkerque-Castelnau	800
Le Havre	250
Lorient-Pen-Mane	300
Marseille	250
Mengam (near Brest) (Transmits messages to ships of the United States Shipping Board, which are provided with continuous wave apparatus)	250
Nice	250
Oran-Ain-El-Turk	300
Quessant	450
Sainte Marie De La Mer (Gulf of Lions)	450

The Basse Lande station was reserved entirely for marine work, until it was found that this could not absorb its entire time. It was then decided to open it for private traffic ten hours a day, leaving ten hours for marine work and four hours for repairs and testing of the apparatus. Most of its work that is not with ships, is in the transmission of telegrams to Constantinople and Beyrouth. Transmission is by remote control from the radio central office at Paris, using hand manipulation for the present. However, automatic machine sending is to be employed in the near future. Receiving is done both at the transmitting station itself and also at a special receiving station located at Bouaye, where a loop receiver is operated.

The antenna at Basse Lande consists of ten wires each 500 meters (1650 ft.) long, supported by six towers. In the near future this system is to be greatly enlarged, the length to be doubled to a thousand meters, and the towers increased to ten in number. At present, 13,000 meters is the wavelength employed and 18,000 will be used on the new antenna. For receiving there is a separate antenna especially adapted to short wave lengths.

The personnel of this station is furnished by the French Navy and consists of a group of eighty-five men, including sailors, rated as radio experts, ordinary telegraphers, electricians, mechanicians and four officers.

IN accordance with article 306 of the Treaty of Versailles, the French Government has declared that the German Meissner patent, which is of considerable importance in radio, may be used freely by the French Government and industries. Licenses under this patent now will be granted to French manufacturers by the French Government itself, and all previous contracts entered into between Frenchmen and the German owners of the patent, now are considered void. The article of the Versailles Treaty under which this action was taken stipulates that the Allied powers have the right to take such action in regard to German patents as may be necessary in the interest of the national defense or the public welfare.

A NEW radio telephone station for communication with aeroplanes has been erected in France, at Abbeville in the department of the Somme. This station will use a wave length of 500 meters and 250 watts power.

TRAVELERS on the excursion boats on the Seine are being treated to surprises these days, radio concerts being picked up both from the Eiffel Tower and from Levallois-Perret. A special antenna was installed on one of these boats for this purpose, with a four-tube receiving set, and four loud speakers. Since the initial success it has been decided to place similar equipment upon all these boats which travel on the Seine between Paris and various points in the suburbs.

DURING the course of a conference presided over by Mr. Ernest Archdeacon, Mr. Daniel Berthelot, of the French Institute, in speaking of radio telegraphy and telephony, stated that the extraordinary development of radio made necessary the universal adoption of Esperanto as the international language. Mr. Berthelot has been an Esperanto devotee for a number of years. Other speakers also supported the claim of the language to use as the radio tongue.

During one of its recent meetings, the Comité du Syndicat National des Industries Radioéléctriques, Paris, appointed a commission to study ways and means of eliminating interference on the part of amateurs.

ON April 18th last, the first public course of radio telegraphy was opened in France at the National Conservatory of Arts and Crafts, under the patronage of the Friends of Radio. So great is the public interest in radio that all seats were taken long before the lecture commenced and many people had to stand during the entire time. General Ferrié, Director of Military Telegraphy was present at this first lecture. Mr. Chaumet, after a short address, was assisted by Mr. Lefranc in explaining the general phenomena of electricity, with suitable experiments with batteries, coils, etc. Following that, lessons were given in the telegraph code, in the construction of a galvanometer, and the building of an amplifier.

ACCORDING to a writer in the Radio-Revue of Paris, a German, M. Y. Nienhold has secured a patent in Germany on a method of amplification without using a vacuum tube. Only the general scheme of the invention has been made public and considerable interest has been aroused in France as to its practicability.

The inventor claims to make use of the electrical properties of colloidal liquids. A colloidal liquid consists of a solution of mineral or organic materials specially prepared, in which the molecules are in constant movement, due, it is thought, to their electrification. Nienhold claims special success in using colloidal liquids prepared from organic compounds, such as pyrogallic acid.

The general method, according to the writer in the French paper, consists of substituting the liquid for the vacuum in any two or three element tube. The electrified particles in the liquid are supposed to function as do the electrons emitted by the filament in the conventional vacuum tube. A "B" battery is used in series with the telephones. On account of the use of this "B" battery, it is important to make sure that the liquid is entirely in the colloidal condition and that no electrolysis takes place.

"This Is the Life"

(*Continued from page* 54)

on the outside by a lightning arrester of the Brach type.

In addition to the Brach lightning arrester, Mr. Hart has provided a 100-ampere, 600 volt single-pole double-throw switch as further protection when the apparatus is not in use. When the switch is thrown to ground it is locked in that position by a padlock. This prevents anyone from cutting in the installation against his wishes and is accomplished in the manner shown in figure 2.

Ground connection is obtained by tapping on the water system and also from a connection leading to a buried copper plate. The plate is buried at a depth which insures permanent moist earth.

The "A" storage battery (6-volt 80-ampere hour) is installed in the bottom section of the cellarette. The "B" batteries are in the middle section and the Westinghouse RC receiver in the top section. All leads are brought out of the back of the cabinet to two double-pole double-throw switches, and either the RC receiver or a loop can be cut into the circuit.

Just above the cellarette on the wall is a map of the United States and every time a new station is picked-up a small pin is stuck in the map. This provides a permanent record which is visible at all times.

The Western Electric power amplifier and horn have been installed on a telephone table which was commandeered for that purpose. Both of the cabinets being furnished with ball-bearing roller casters, it is an easy matter to move both of them into a small closet nearby if desired.

Finally we come to the most important part of this article, which is Mr. Hart at ease enjoying good music via radio.

"This is the life," says Mr. Hart.

The Monthly Service Bulletin of the

NATIONAL AMATEUR WIRELESS ASSOCIATION

Guglielmo Marconi, *President* — J. Andrew White, *Acting President* — H. L. Welker, *Secretary*

Founded to promote the best interest of radio communication among wireless amateurs in America

NATIONAL ADVISORY BOARD OF VICE-PRESIDENTS

Maj. Gen. George O. Squier, *Chief Signal Officer, U. S. Army*
Prof. A. E. Kennelly, *Harvard University*
Prof. Alfred N. Goldsmith, *College of the City of New York*
E. E. Bucher, *Instructing Engineer*

HEADQUARTERS: 326 BROADWAY, NEW YORK

ALTHOUGH the radio regulations for New Zealand have been extended to apply to Samoa, it is reported that more latitude is given the amateurs, and that an effort to regulate broadcasting stations is being made before interference begins. Samoa is designated as the Fifth New Zealand Radio District with the officer in charge of the Apia Radio Station as inspector of local radio reception and transmission.

Except that it is necessary to secure a license and pay a small license fee, amateurs are unrestricted in radio reception, but licenses are not to be issued for circuits which cause interference. Amateur transmitting stations in Grade I require the supervision of a licensed operator and are assigned on wave lengths between 150 meters and 180 meters, the power being limited to 50 watts. Grade II operators are restricted to a 140-meter wave, and five watts in power. All amateur transmission is prohibited between 7 and 8 P. M. without any exceptions.

△ △

A LARGE turnout of members of the Milwaukee Radio Amateurs Club, Inc., marked the visit of R. H. G. Mathews, 9ZN, Central Division Manager of the A. R. R. L., and F. J. Marco, 9CD, "FJ" at 9ZN, and Secretary of the Chicago Radio Traffic Organization. Mr. Mathews spoke under the title of "Construction and Operation of Radio Receptors" and Mr. Marco, "Some Recent Experiments with I. C. W." Following their talks at the club meeting they were taken to station 9AAP where among other things Mr. Mathews listened to his own station, WJAZ.

E. T. Howell, Sc.M., Technical Committee Chairman, has been very regular with his recent weekly reports, the subjects discussed in some of the more interesting ones being the new improved Reinartz receptor, syntonized grounds, aerials, and University of Illinois stations 9XJ and WRM. Station 9AAP, owned by Marian Szukalski, Jr., one of the society's directors, was the only local station to be entered in the trans-Pacific tests. The club's code class for fans and others is being conducted by H. F. Wareing, pre-war 9AEX and a former Marconi operator. Weekly meetings continue to be held at 8:00 P. M., Thursdays, in the Public Museum Trustees' Room, and the Club's office to which general correspondence should be addressed is 601 Enterprise Bldg., Milwaukee, Wis.

Fifteen-year-old H. H. Hildersley was awarded 1st Prize at the Handicraft Exhibition, London, for his combination one-tube crystal set through which he has heard American stations

DURING the fall and winter of 1922-23, 5ZA was reported from England, Switzerland, Panama, west of Hawaii, Alaska, all states of United States, from five districts of Canada, Mexico, Honduras, Porto Rico, and Costa Rica. The power used was under 400 watts input, pure C.W., with D.C. on plates. Actual communication was maintained with 1BDI, Orono, Maine, 4OI, Porto Rico and many other distant stations.

Operators in forty states, Panama, Hawaii, Canada, Mexico, reported hearing the voice from 5ZA. Two way voice connection has been maintained up to 1,600 miles, with an input of less than 250 watts.

THE West Haven Radio Association has been organized with Warren T. Slowen as president, John W. Anderson, vice president and Albert J. Nielsen, secretary-treasurer.

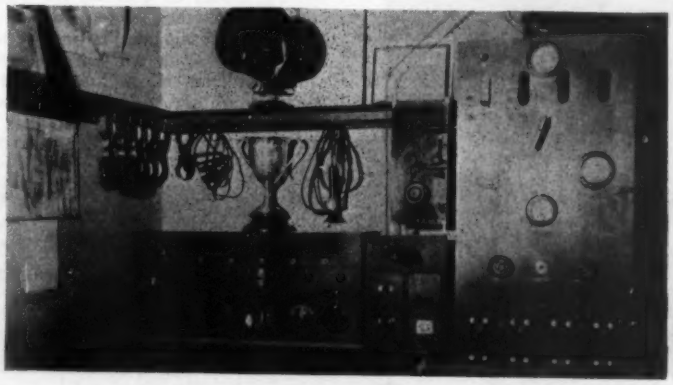
Through the kindness of Mr. Shutter, the association will hold two meetings a week at Shutter's Radio store. Anyone desiring to apply for membership should get in touch with the secretary at 116 Taft Avenue, Allingtown.

△ △

SUCCESS met the second attempt of Canadian radio amateurs to relay a message across the continent. Twenty-three minutes after O. Bail, amateur operator of Station 2HG at Montreal, tapped off a message on his key, a reply came back from Station 5CT, operated by W. F. Reeves, at Duncan, Vancouver Island over the broad expanse of Canadian mountains more than 2,800 miles.

As Canadian amateur stations are thinly distributed and reception is difficult on account of the peculiar geography of the country, this feat compares favorably with the 1921 record of American amateurs who relayed a message across the continent in 6½ minutes.

Canadians were unsuccessful in their first attempts March 24, 25 and 26 on account of atmospheric conditions, accompanied by aurora. Several amateurs who participated in these tests declared that reception was dead in many parts of the country and signals came in faintly practically everywhere. The final success marks a new era for Canadian amateurs.



Operators in forty states, Panama, Hawaii, Canada, and Mexico have reported hearing this station, 5ZA

AN amateur radio station has succeeded in transmitting signals approximately half way around the world, establishing a new long distance record. A ship operator reports that he heard the station operated by E. W. Rouse at Galveston, Texas, 100 miles southeast of Ceylon in the Indian Ocean, 11,000 miles distant.

△ △

THE signals of two other amateur stations were picked up in mid-Pacific, 7,000 nautical miles distant, by R. E. Roesch, radio operator on board the steamship *Easterner*. The stations heard were those of W. D. Reynolds, Denver, Colorado, call 9JE and W. A. C. Hemrich of Seattle, Wash., call 7SC.

△ △

THE General Electric Company at Schenectady, N. Y., will give a brand new U V-199 tube for any old style tube, burnt out or not, or any tube of foreign make sent by the owner, to add to their museum. Description of tube must be sent to the company first for acceptance.

△ △

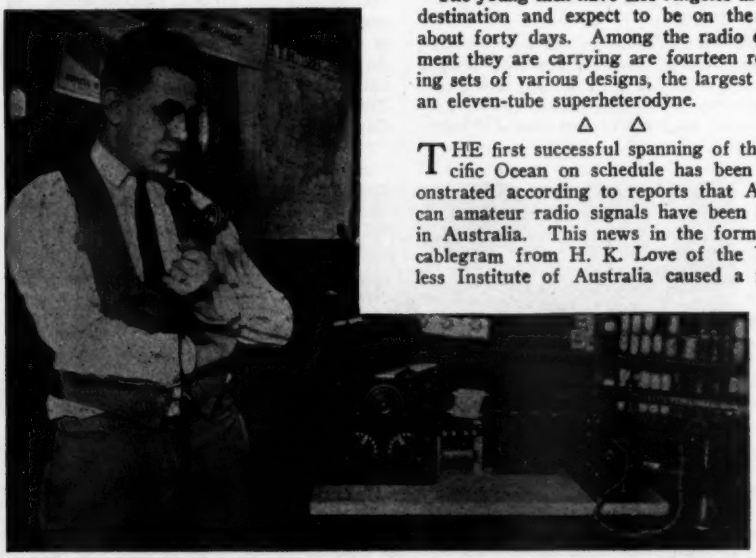
SIGNALS from 9DGE, an amateur wireless station operated by Harold Olson at 3217 Sheridan Avenue South, Minneapolis, Minn., have been heard in New Zealand, according to a letter received Saturday by Mr. Olson from R. M. Slade, an operator on the island dominion. The distance is approximately 8,200 miles.

△ △

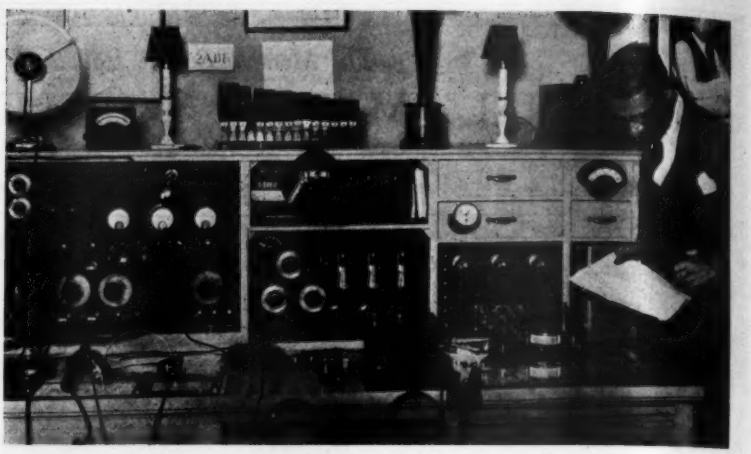
IN recent weeks there has been a great deal of comment on the possibility of long distance communication below 150 meters wave length, and it is only natural that the amateur should again demonstrate that he is the pioneer when it comes to this particular phase of radio development.

The signals of amateur station 6GI, operated by Archie Wade, of 465 N. Lake Street, Los Angeles, Calif., transmitting on a wave length of 120 meters, has been heard in every State in the Union. This station holds the record for short wave transmission, the power being only five watts.

Other long distance records on short waves have been reported by other amateurs who conducted short wave tests and it would appear from this information that very good results can be obtained on these low wave lengths.



One of the smallest transmitting stations licensed—9CEX, was constructed by L. W. Applebaum of Chicago



George Freisinger's $5,000 station, 2ABT—300-watt transmitter at left; combination transmitter and receiver of the navy type, using 20-watt tubes for transmitting and a honeycomb-regenerative set for receiving with two steps of a.f.; front center, a special type amateur receiving unit; right, a three-stage power amplifier

△ △

TECHNICAL talks on amateur continuous wave transmitters and practical amateur transmitting by John L. Reinartz of South Manchester and Boyd Phelps, who is now working in the research laboratories of the C. F. Tuska Co. of Hartford were the features of the monthly meeting of the Radio Club of Hartford recently at the Hotel Bond. Mr. Reinartz spoke on building a successful amateur transmitting station and Mr. Phelps spoke on master oscillators.

△ △

FREDERICK GANNENHAUER, Bywood, Pa., and Howard Berliner, 2133 Spring Garden Street, radio experimenters, left Philadelphia recently in an automobile equipped with radio apparatus with which they expect to conduct elaborate researches in various parts of the country to determine factors affecting wireless transmission.

The young men have Los Angeles as their destination and expect to be on the road about forty days. Among the radio equipment they are carrying are fourteen receiving sets of various designs, the largest being an eleven-tube superheterodyne.

△ △

THE first successful spanning of the Pacific Ocean on schedule has been demonstrated according to reports that American amateur radio signals have been heard in Australia. This news in the form of a cablegram from H. K. Love of the Wireless Institute of Australia caused a flurry of excitement among operators in California and other Western States, many of whom made enviable records in the trans-Atlantic tests of last year.

Reception of amateur signals has been reported from time to time by operators on ships off the coast of Australia and China. Never until recently has there been any organized effort to transmit signals across the Pacific Ocean on a definitely arranged schedule. The tests were made at the suggestion of Australian amateurs.

Although no long distance records were broken, it is significant that American signals were heard clearly and consistently and complete information from the receiving end may show that some amateurs east of the Rockies may have got their signals over unawares.

It is definitely known, however, that signals from Major Mott's station at Avalon, Calif., 6XAD (6ZW) were heard by C. D. Maclurcan, of Sydney, N. S. W.

△ △

AMATEURS are still entering the game of "key pounding" at the rate of nearly three hundred a month. Since January 1, of this year, 1334 amateur licenses have been granted by the Department of Commerce, and on June 5, there were 18,232 such licensed stations in the United States.

The distribution of amateur stations by Districts June 5th, was as follows:

District	Hdq.	Total
1	Boston	2490
2	New York	2629
3	Baltimore	1994
4	Norfolk	444
5	New Orleans	941
6	San Francisco	2172
7	Seattle	901
8	Detroit	2932
9	Chicago	3729
	Total	18,232

The above table does not include special amateurs, of which class there are 201, no new licenses of this class having been issued recently. It has been decided by the Department that hereafter District Radio Supervisors will issue special amateur station licenses instead of the Washington Office.

Queries Answered

Answers will be given in this department to questions of subscribers, covering the full range of wireless subjects, but only those which relate to the technical phases of the art and which are of general interest to readers will be published here. The subscriber's name and address must be given in all letters and only one side of the paper written on; where diagrams are necessary they must be on a separate sheet and drawn with India ink. Not more than five questions of one reader can be answered in the same issue. To receive attention these rules must be rigidly observed.
Positively no questions answered by mail.

Joseph Block, New York City.

Q. In reference to figure 14, page 68, of the March issue of THE WIRELESS AGE, do coils DL-250, 1250 and 1500 of the oscillating tube, have to be in inductive relation or mounted at right angles to each other? Is the DL-250 and .001 variable condenser absolutely necessary?

A. The coils in question should be mounted at right angles to each other. The DL-250 coil and .001 condenser are necessary if the coils are placed so as to be non-inductive. But they may be omitted if arrangement is made to vary the coupling between DL-1250 and DL-1500. (See figures 6, 7, 8, and 9 of Mr. Ringel's article.) Some provision must then be made to change this variation frequency by making the condenser shunting the DL-1250 variable.

* * *

O. Ingomar Oleson, Ambrose, N. D.

Q. 1. What determines whether the negative B battery terminals are connected to positive or negative A battery leads? In the different hook-ups we see the connection made both ways.

A. 1. It is immaterial whether the negative B battery is connected to positive or negative A battery. In case connection is made to positive A battery, the effective B battery voltage is increased by the voltage of the A battery.

Q. 2. Should the filament rheostat be on positive or negative side of a battery? Why?

A. 2. If the filament rheostat is connected in the negative lead and the grid circuit is then completed through the negative A battery terminal, the grid is then slightly negative with respect to the negative filament terminal of the tube by an amount equal to the voltage drop in the rheostat. If the rheostat is in the negative lead and the grid circuit is completed through the negative filament terminal of the radiotron itself, the grid is at the same potential as the negative end of the filament. If the rheostat is in the positive lead we cannot, of course, then obtain a negative bias on the grid, since the grid circuit is connected to the negative end of the filament. When using a potentiometer in a radio frequency amplifier it is advisable to connect the filaments in the negative leads so that we may then obtain a slight negative voltage in the grids. In any amplifier it is quite desirable to do so, since with the grid slightly negative, less distortion is obtained and less current is drawn from the B batteries which supply the plate current.

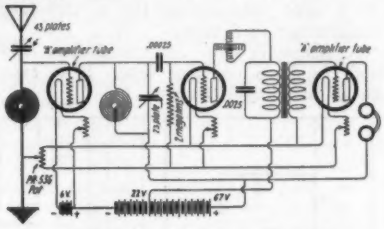
Q. 3. Why does a detector tube not function equally well without grid condenser and leak?

A. 3. The theory of the action of a grid condenser and grid leak is too complicated to be answered in these columns. Its action is very thoroughly explained in E. E. Bucher's "Vacuum Tubes in Wireless Communications" and other Wireless Press books.

* * *

B. C. Madden, Jr., San Francisco, Calif.

Q. 1. Please publish a hook-up for a set employing one stage of radio frequency amplification, detector, and one stage audio-frequency amplification and using three spiderweb coils, a 43-plate condenser, a 23-plate condenser and a variometer in the circuit.



A. 1. Below is circuit you request.

Q. 2. What is the approximate distance I should receive music with an aerial 150 feet long and 40 feet high?

A. 2. Under good conditions you should have no difficulty in receiving stations 1,000 miles distant.

Q. 3. Does Bakelite chip or crack when you are drilling holes with an ordinary metal drill?

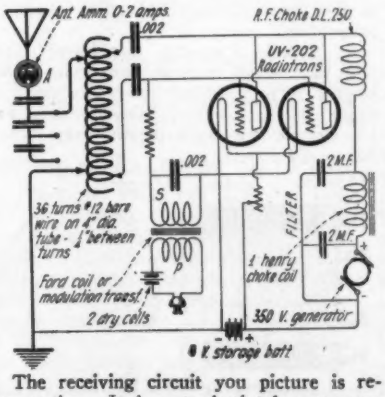
A. 3. In drilling Bakelite, it is advisable to clamp a piece of wood behind the Bakelite so as to prevent chipping, when the drill emerges on the other side. An ordinary drill is quite satisfactory.

* * *

Arthur P. Dillow, Florence, Colo.

Q. I would like to know a circuit which will transmit voice up to forty miles, and the parts used. The high school desires to put one up here and doesn't know what parts to use. Is the following circuit a regenerative or not and is it correct?

A. Below is hook-up for 10-watt radiophone transmitter operating from D.C.



The receiving circuit you picture is regenerative. It is not absolutely necessary to use the variometer or the two coils in the filament lead.

* * *

B. O. Spangler, Elmhurst, Ill.

Q. 1. I have built a set using the circuit diagram in your January, 1923, issue of THE WIRELESS AGE, page 68. I am unable to get 400,000 ohms resistances used in shunt to the secondary of the amplifying transformers. Also the 20,000 ohms resistances in the B battery circuit. Will you kindly advise me where I may purchase these units?

A. 1. Use Radio Corporation grid leaks UP 515 for the 400,000 ohms resistances. These may be purchased in any reliable radio shop. The 20,000 ohms resistances may be purchased from the Ward-Leonard Electric Co., Mt. Vernon, N. Y.

Q. 2. I have been using the set without the above resistances, but cannot get the power amplifier to work. I have changed the tubes, also the transformer. The detector and two-step work fine, but have been unable to get anything but a howl from the power transformer.

A. 2. Try using a 3-1 ratio transformer on the power amplifier.

Q. 3. I am using American transformers 10-1 ratio in first step, 3-1 second step, and a 5-1 with the power tube. My tubes are mounted on a long strip, 5 inches back of the panel and at the top. The transformers are mounted on another strip under the tubes. Could my trouble be in the mounting?

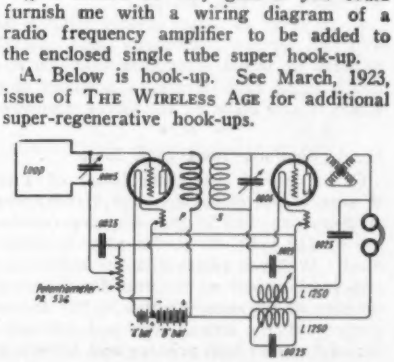
A. 3. Arrange the transformers so that the iron cores are at right angles in all three transformers. Also try the effect of connecting the cores together and then to ground. All leads, especially those connected to grid and plate must be made very short. Connecting the 400,000 ohms resistances will probably eliminate the howls.

* * *

R. Dichmont, Calgary, Alberta, Canada.

Q. I should be very glad if you could furnish me with a wiring diagram of a radio frequency amplifier to be added to the enclosed single tube super hook-up.

A. Below is hook-up. See March, 1923, issue of THE WIRELESS AGE for additional super-regenerative hook-ups.



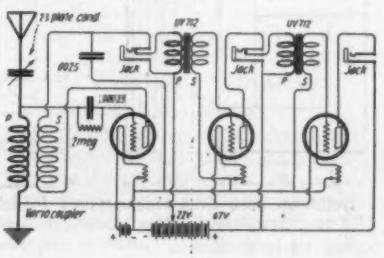
Note: Use 1250 turns in both oscillator coils and a .0025 condenser.

* * *

Harold Collins, Lowell, Mich.

Q. Please publish a hook-up for two-stage regenerative set using three UV-201-A tubes. For tuning I wish to use a variocoupler and two 23-plate variable condensers, one of which is to be used in the aerial, the other to be switched into the secondary circuit only as needed to tune out interference.

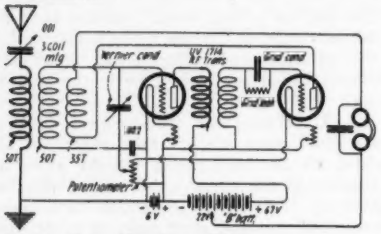
A. Below is circuit:



Webster Wells, Rockville Centre, L. I., N. Y.

Q. I am looking for a hook-up that will give primarily clear undistorted reception; secondly, distance. I intend adding to it from time to time. I have the following apparatus: Vernier .0005 variable condenser; one .0005 straight variable condenser; one .001 straight variable condenser, one R. C. A. radio frequency transformer; honeycomb coils, etc.; potentiometers; UV-201 hard tubes; sockets; rheostats; variable grid leak condenser; three .006 fixed condensers; one .005 fixed condenser; one .001 fixed condenser; one .002 fixed condenser.

A. Below is a hook-up that should give you good results. We would advise adding two stages of audio frequency amplification so that loud speaker operation may be obtained.



O. N. Gay, Mendon, Ill.

Q. I have a Grebe Type CR-9 serial No. 633; can I improve the set in any way to make it louder? Am using radiotron tubes 200 and 201? Can I add anything that will make set tune sharper?

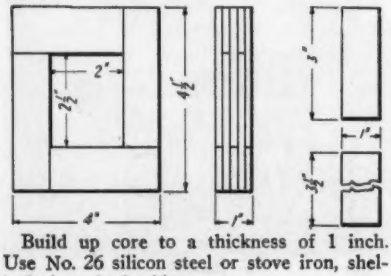
A. In order to obtain greater distance as well as greater selectivity and signal strength we would recommend that you obtain a tuned radio-frequency amplifier unit which is also made by the Grebe company.

* * *

H. A. Spafford, Iowa City, Iowa.

Q. In one of the recent issues of THE WIRELESS AGE (I think it was March) you published an article and diagram on the use of 110 volts A. C. for plate and filament. Will you please give me more definite specifications of the transformer used, the size of the core, whether it has an air gap or not, the size of wire and the number of turns on both primary and secondary coils. Also the divisions and taps on the secondary coil for the filament and plate voltages. I have noticed several articles in THE WIRELESS AGE on the use of A. C., but I have not noticed any that gave complete specifications.

A. You will find additional information on the operation of vacuum tubes from A. C. in the December, 1922, issue of THE WIRELESS AGE, page 72. Below are specifications for transformer with four windings:



Build up core to a thickness of 1 inch. Use No. 26 silicon steel or stove iron, shellacked on both sides.

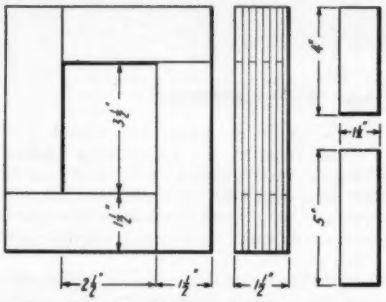
Windings—110-volt primary turns—450 turns No. 22 D.C.C. wire; 8-volt secondary—35 turns No. 12 D.C.C. wire; 140-volt secondary—600 turns No. 26 D.C.C. wire. It may be advisable to tap the 140-volt secondary.

* * *

Fred L. Mayer, Jr., Mt. Pulaski, Ill.

Q. Will you kindly give me dimensions, size of wire, size of core, number of turns for primary, size of wire and number of turns for secondary for a step-up transformer that has an output of 1,000 volts, to be used on 110 volts 60-cycle current. Also same information for a step-down transformer to 8 volts.

A. Below is data for transformer with both windings on same core. It is capable of handling 100 watts.



Use No. 26 silicon steel or stove iron shellacked on both sides.

Winding—110-volt primray—500 turns No. 16 S.C.C. wire; 8-volt secondary*—40 turns copper ribbon ¼ inch x 1/32 inch if you use heavy current; 1,000-volt secondary—4,800 turns No. 28 D.S.C. wire.

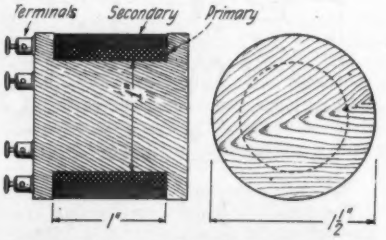
* Note: If you wish to draw less than 8 amperes from the 8-volt winding, it will be sufficient to use No. 10 or No. 12 D.S.C. wire. If you desire these transformers to be separate, the size of core and number of turns will still hold.

* * *

John H. Connors, Jr., Taunton, Mass.

Q. I am writing to you to ascertain the number of turns of wire that are necessary in the construction of a radio frequency transformer.

A. A radio frequency transformer that will include all present broadcast wavelengths is very difficult to obtain using a single coil. However, below is data for transformer for wave lengths from about 340 to 450 meters.



Each winding consists of 200 turns of No. 28 S.S.C. wire. Three layers in each winding. Separate the windings with paper.

* * *

Marjorie Banner, Mt. Airy, N. C.

Q. 1. In your May issue I noticed in column "Queries Answered" a De Forest D-7 reflex circuit diagram which is quite interesting. Would you mind giving me the following data? The size of the loop?

A. 1. Loop—12 turns of No. 118 wire on a loop 30 inches x 30 inches, 1½ inches between turns.

Q. 2. The capacity of variable condenser?

A. 2. Maximum capacity of variable condenser is .0005 microfarad—a vernier adjustment is advisable.

Q. 3. The capacity of fixed condenser, which is connected with the third radio frequency transformer?

A. 3. Fixed condenser—.002.

Q. 4. What is the best type of crystal?

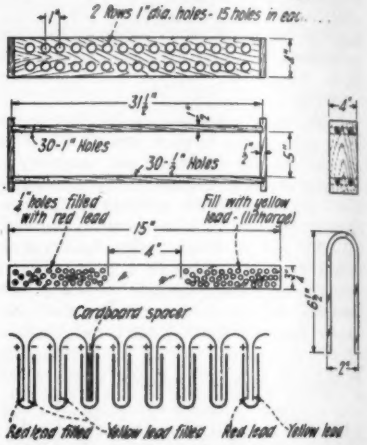
A. 4. Galena is best for the crystal.

* * *

Walter King, Detroit, Mich.

Q. Would you kindly give me complete directions and list of material necessary to make a storage B battery?

A. A 60-volt storage B battery.



Paint stand with acid proof paint or with hot paraffine. Cut lead strips 15 inches long x ¾ inch wide x ⅛ inch thick. Drill a number of ¼ inch holes except for a length of 4 inches in the middle. Bend strips over as shown. Make a paste of red lead and a 10 per cent. solution of sulphuric acid and fill the holes on one side of the strip; make a paste of yellow lead (also called litharge) and sulphuric acid and fill the holes on the opposite side of the lead strip. The red lead is the positive and the yellow lead the negative terminal.

Test tubes 1 inch diameter x 6 inches long are placed in the stand and the strips of lead inserted in the manner shown. If trouble is experienced in keeping the strips apart, heavy cardboard soaked in water glass (sodium silicate) should be placed between them. Both rows are connected in series.

Each cell is filled with a 20 per cent. solution of sulphuric acid until the acid is ½ inch from the top. The test tube and exposed parts of the lead plates should be then painted with hot paraffine.

The charging rate is about ½ to 1 ampere. For additional information see Chapter XVII of "Practical Amateur Wireless Stations," published by Wireless Press.

* * *

Julius H. Crane, York, Nebr.

Q. Please tell me where I can get Litzendraht No. 24 D.C.C. wire.

A. There is no Litzendraht made of No. 24 D.C.C. wire. The standard forms of Litzendraht are 3 x 16 x No. 38, 20 x No. 38 and 10 x No. 38. Litzendraht may be purchased from the following concerns:

Belden Wire Co., Chicago, Ill.
James Goldmark & Co., 83 Warren St., New York City.

STATIONS WORKED AND HEARD

Stations worked should be enclosed in brackets. All monthly lists of distant stations worked and heard which are received by the 10th of each month will be published in the next month's issue. For example, lists received by July 10th will be published in the Aug. issue. Spark and C. W. stations should be arranged in separate groups.

5ANC, 223 So. 3rd St., Enid, Okla.

CW—1ach, 1aw, 1bes, 1bwj, 1byn, 1cpn, 1gs, 1gv, 1pm, 1qp, 1rm, 1tt, 1xm, 1ze, 2awf, 2ccd, 2cjc, 2el, 2gr, 2ig, 2nz, 2xad, 2zs, 3ajj, 3arp, 3bj, 3buy, 3can, 3cgw, 3fq, 3jj, 3mb, 3oe, 3ot, 3vm, 3zo, 4aap, 4aiv, 4bq, 4bi, 4cy, 4dx, 4ea, 4eb, 4ob, 4od, 4oi, 4jk, 4ya, (too many fives), 6abx, 6alu, 6apw, 6aqp, 6arb, 6bgh, 6bjq, 6boe, 6bpb, 6bqc, 6bqd, 6un, 6bun, 6cc, 6cbi, 6cgw, 6eb, 6ec, 6ex, 6en, 6iv, 6jn, 6ka, 6rr, 6wh, 6zh, 6zw, 6zz, 7ad, 7afw, 7aik, 7ahc, 7bs, 7dh, 7bj, 7oh, 7lr, 7to, 7tq, 7wm, 7zz, 7zu, (too many eights and nines).

Canadian—CW—2an, 3co, 3ji, 2nb, 2ni, 3sx, 3zs, 4hh, 9bx.

8ZT, D. C. WALLACE, 54 Penn Ave. N., Minneapolis, Minn. (May.)

1vv, (1bwj), (1cpn), (2fp), (2ts), (2a6b), (2ccd), 3bn, 3fq, 3gb, 3hg, (3hh), 3jj, 3qi, (3zo), (3abw), (3ava), 3ccu, 4jl, 4my, (5bw), (5ek), (5ll), (5mn), (5zm), (5aec), (5agn), (5zab), 6ea, 6eb, (6ec), 6jd, 6km, 6mh, (6nx), 6rv, (6ti), 6zg, (6aak), 6adx, (6alk), (6alv), (6alx), (6apv), (6arb), (6auu), (6auy), 6aun, (6bbc), 6beg, 6beo, 6bic, 6bih, 6bjq, (6bly), (6bnt), (6bpb), 6bqc, 6brj, 6bun, 6bur, (6buy), (6bgv), 6bvf, (6bvs), (6cay), (6cbi), 6cbu, 6cdb, 6cfq, (6cgw), 6chl, 7gs, (7jw), (7nk), (7qt), (7sc), 7wm, 7ws, (7zn), (7zu), 7zv, (7abs), 7azf, (8cf), (8fl), (8rv), (8tj), (8ada), (8apw), (8bdr), (8bdu), (8bsy), (8bvr), (8bvt), (8byn), (8cse), (8cug), (8cuu), (8cvg), (8ddw), (8dge), (8yae).

Canadian—(3de), 3ko, 3nb, (3si), 3uj, 4ao, 4cl, 4cn, 4fn, (5go).

Book Reviews

The 1923 Year Book

THERE is one book on radio of which it is hardly necessary to say more than that it is ready for the public: "The Year Book of Wireless Telegraphy and Telephony." The 1923 edition of this now is ready, and as usual is the current authority on such matters as radio history, the radio laws and regulations of all countries, and similar data. There is a complete directory of the land and ship stations of the world; data on the transmission of time signals, meteorological information, direction finding, by countries; summaries of important radio patents; leading articles on automatic reception, antennas, vacuum tube design and manufacture; useful data such as terminology, foreign equivalents, tables and symbols; biographies and obituaries; information on radio books and periodicals; and a résumé of amateur and experimental progress. In its cloth edition the book is 2¾ inches thick, and its value is as great as its size is impressive. There is also a paper-bound edition, somewhat abridged.

"The Year Book of Wireless Telegraphy and Telephony." London, The Wireless Press, Ltd. New York, The Wireless Press, Inc., 326 Broadway. Price, paper, $3.00; cloth, $6.00.

New English Books

ENGLAND, where broadcasting is not six months old, is going through the process of learning all about it. The main source of knowledge, as in this country, is in books. One of the English books, "Your Broadcast Receiver," by Percy D. Harris, has already gone into two editions. This is a well-written exposition of the elements of radio telephony, and is made for the use of the man or woman who buys assembled apparatus and wants to know how to work it. It is well illustrated.

Again, there is "How to Build Amateur Valve Stations," by Philip R. Coursey. This is much more technical, assuming some knowledge of radio diagrams, at least, on the part of the reader. It is of special interest to the constructor and experimenter, with, however, enough simplicity in its treatment to make it intelligible to the ordinarily well-informed person.

On a much higher basis is Part Two of "The Radio Experimenter's Handbook," also by Coursey, which contains some mathematical considerations of such things as high frequency currents and voltages, frequency and wave length, circuit constants, inductances and capacities, and similar engineering matters. It is of considerable value to the technically-equipped student who is investigating fundamentals in radio, and who has at least a fairly well equipped laboratory.

All these books, being printed in England, contain a certain number of Englishisms, such as calling a tube a "valve," and using a different diagrammatic form to indicate it in a diagram. However, that does not detract from their value in this country.

"Your Broadcast Receiver and How to Work It," by Percy W. Harris. Paper, 68 pages. London, The Wireless Press, Ltd. American agent, The Wireless Press, Inc., 326 Broadway, New York City. Price, $0.35.

"How to Build Amateur Valve Stations," by Philip R. Coursey. Paper, 72 pages. London, The Wireless Press, Ltd. American agent, The Wireless Press, Inc., 326 Broadway, New York City. Price $0.75.

"The Radio Experimenter's Handbook," Part 2, by Philip R. Coursey Boards, 72 pages. London, The Wireless Press, Ltd. American Distributor, The Wireless Press, Inc., 326 Broadway, New York City. Price, $1.75.

Fleming's Lectures in Print

IN December, 1921, and January, 1922, J. A. Fleming, M.A., D.Sc., F.R.S., gave a series of radio lectures at the Royal Institute of Great Britain, in London The lectures were overwhelmingly popular. The famous inventor of the Fleming valve drew audiences that jammed the hall to the utmost of its capacity. In fact, the theater of the Royal Institute was not large enough to hold all those who desired to attend, attracted not only by the fame of the lecturer, but by the immense, popular interest in his topic.

Hence it is entirely natural that the text of these lectures should appear in print; it seemed certain that their reproduction in book form would be welcomed alike by those who attended their delivery, and those who missed them for one reason or another. In print they now are, with some amplification.

The lectures were accompanied by platform experiments by way of illustration, and while the book cannot reproduce the considerable interest and sometimes thrilling results that marked those experiments, it does very well indeed with copious diagrams and illustrations of those experiments.

The volume, which is dated March, 1923, will be useful not only to those who wish to become acquainted with the fundamentals of radio telegraphy and telephony, both transmission and reception, but is an historic document of considerable importance. The story of the development of the vacuum tube and of its many applications, is one of the newest fairy stories told by science; and here that tale is related by one who played one of the few central rôles in the pioneer work.

"Electrons, Electric Waves and Wireless Telephony," by J. A. Fleming, M.A., D.Sc., F.R.S. Cloth, 326 pages. London, The Wireless Press, Ltd. American distributor, The Wireless Press, Inc., 326 Broadway, New York City. Price, $2.50.

For Electrical Experiments

RADIO experimenters who have, through their work with wireless apparatus, cultivated a taste for electrical experimentation, will find "Electric Toy Making" a stimulus to carry on work of that kind. The title of the book is somewhat misleading, as only a very small proportion of the contents is given to toys, such as electric locomotives. Considerably more than one-half the volume describes electrical devices of more or less value and convenience in the home, such as may be assembled by any ingenious experimenter.

"Electrical Toy Making," by T. O'Conor Sloane, cloth, 254 pages, with many illustrations and diagrams. New York, Norman W. Henley Publishing Company, 1923. Price $1.50 from the publishers, or from the Wireless Press, 326 Broadway, New York City.

Explains Standardization Work

THOSE who are following the development of radio standards by the Institute of Radio Engineers and the American Institute of Electrical Engineers will be interested in the 1923 Year Book of the American Engineering Standards Committee, which has just appeared. The A. E. S. C. is the national governing body under whose guidance present-day standards in many lines are being developed, and it, of course, is co-operating with the I. R. E. and the A. I. E. E. in the radio standardization work. The 1923 Year Book contains a summary of the history of the Standards Committee, a resumé of the work so far accomplished in all engineering lines, and the rules and constitution. Those who wish to inform themselves of the nature of the work and structure of this organization that is playing so important a part in American engineering are referred to this Year Book, which may be obtained from the American Engineering Standards Committee, 29 West 39th Street, New York City.

Fourth Edition, Amateur Radio Call Book

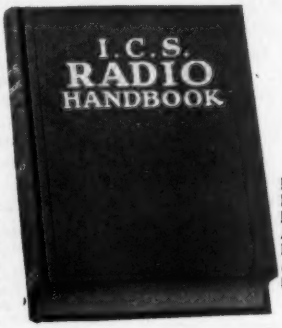
OVER 20,000 call letters of stations in the United States and Canada are listed in the fourth edition of the Amateur Radio Call Book, including amateur commercial army, navy, transoceanic and broadcasting stations.

EVERY RADIO FAN
SHOULD HAVE THIS BOOK

THE greatest book on radio ever written. Price only $1. Filled with sound, practical, tested information for every radio fan, from beginner to hard-boiled owl. Written, compiled and edited by radio experts of national reputation.

Every page tells you something useful. And there are 562 pages! More than 150 illustrations and diagrams!

You may dip into this I. C. S Radio Handbook at random, or hunt up special information you want, or read it right through. Different types of receiving and sending hook-ups are explained; proposed insurance regulations; lists of broadcasting stations; radio compass stations: interesting experiments; definitions; codes and symbols; technical data and thousands of suggestions for getting more pleasure out of radio. Will save you from wasting money on things that won't work.



Only $1

562 PAGES

Compiled by
HARRY F. DART, B.S.E.E.
Formerly with the Western Electric Co., and U. S. Army Instructor of Radio. *Technically edited by* F.H.DOANE

Send $1 today and get this 562-page I. C. S. Radio Handbook before you spend another cent on parts. Money back if not satisfied.

International Correspondence Schools
Box 6020,
Scranton, Penna.

I enclose One Dollar. Please send me—postpaid—the 562-page I. C. S. Radio Handbook. It is understood that if I am not entirely satisfied I may return this book within five days and you will refund my money.

Name .....

Address .....

BE SURE TO HEAR A "WARE"

Before Purchasing Your Receiver

Most Sensitive Receivers on the Market

ASK YOUR DEALER

Ware Radio Corporation
160 Duane Street, New York

Get on the subscription list of THE WIRELESS AGE and you'll be sure of getting your copy.

Know what they are doing in Europe — *Read*

The WIRELESS WORLD *and* Radio Review

Published monthly—$7.00 per year

Keep in touch with the latest developments on the other side

Send orders to

WIRELESS PRESS, INC.
326 BROADWAY N. Y.

FIVE REASONS why the SHORT CUT ANTENNA is

BETTER THAN AN AERIAL

1. Makes ANY Bulb Set Portable.
2. Reduces STATIC to a Minimum.
3. Gives Distinct Reception.
4. Cuts Out Interference.
5. Eliminates Lightning Hazard.

THE SHORT CUT ANTENNA is being used by the Royal Flying Corps of England and is in use in America by thousands of Radio Enthusiasts. Write your name and address on the margin of this ad and mail it to us with $5.00. If the Short Cut does not do all we say, return it within ten days and get your money back.

SHORT CUT RADIO CORPORATION
243 West 54th St., Dept. A, New York.

Can be mounted in Cabinet.

Construction and operation of the Reinartz tuner, detector, and one-stage amplifier, is described in the book.

Perhaps the most attractive feature is the two-color map of the United States and Canada, 2 x 3 feet, showing radio district boundaries, standard time lines, geographical location of broadcasting stations, etc, as well as containing an alphabetical list of broadcasting stations.

The Amateur Radio Call Book, paper, 162 pages, $1.00. Published by the Radio Directory and Publishing Company, New York City. For sale by The Wireless Press, 326 Broadway, New York.

Booklet Reviews Radio

"RADIO, THE THIRD YEAR," is an interesting little booklet which has been prepared for general distribution by P. C. Kullman & Co., 110 Nassau Street, New York. As the title indicates the booklet covers the accomplishment of radio during the past three years and will undoubtedly be of interest to the readers of THE WIRELESS AGE, who may obtain copies upon request of Kullman & Co.

Tuning the Paragon

OCCASIONALLY a manufacturer of radio apparatus issues an instruction book that is not only that, but a treatise as well. "Getting Acquainted with Radio Receivers" is the latest member of that somewhat small but admirable class. Paul Godley wrote it around his Paragon receiver, but it takes in such a wide area surrounding its central figure that users of regenerative apparatus of other makes may also find it instructive. Probably the most valuable part of it consists of detailed instructions for tuning, whereby Paragon owners will be able to get the most out of their sets. As most amateurs know, this is a set whose admirable efficiency can be realized only with intelligent manipulation. That the booklet makes possible, including not only text but wiring diagrams. Godley has set a price of 25 cents on the booklet, in recognition of its double character of treatise and instruction sheet.

For sale by Adams Morgan Co., 8 Alvin Ave., Upper Montclair, N. J.

For Radio Constructors

PEOPLE who like to construct their own apparatus or to assemble it may be classified into two types: one, those who find circuit diagrams to be sufficient, and two, those who prefer to assemble sets from standard parts.

M. B. Sleeper caters to both these types in his two latest booklets. One of them, "101 Receiving Circuits," is a 46-page booklet containing circuit diagrams with text matter explaining the principal features of each circuit from a practical point of view. The other booklet, of the same size, "Six Successful Radio Sets," describes in detail and shows by photographs and drawings, six different types of receivers, with detailed instructions for assembly and wiring, with hints for operation.

101 Receiving Circuits, by M. B. Sleeper, Radio and Model Engineering Series No. 3, paper bound, 46 pages, price 50c, from M. B. Sleeper, 88 Park Place, New York City or The Wireless Press, 326 Broadway, New York.

Six Successful Radio Sets by M. B. Sleeper, Radio and Model Engineering Series No. 3, paper bound, 46 pages, price 50c, from M. B. Sleeper, 88 Park Place, New York City or The Wireless Press, 326 Broadway, New York.

The Station of Greenhorn's Fate

(Continued from page 56)

"I was up all night," laughed Blank. "I've got a crack set now, and don't mind it."

"You are one man in a million," answered the Captain. "Are you going to stay with us—make another trip?"

"Does anyone ever make two trips on the *Lake Shore?*" asked Blank.

"No," the Captain admitted. "They don't. But you have been different from the others all along, and I thought that you might—"

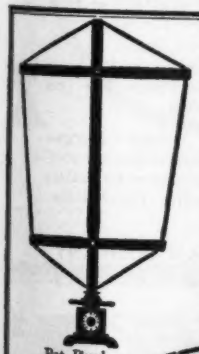
"I will," answered Blank, "If it is only to make those fellows up in the Dot-Dash open their eyes. I'm going to stay on this ship until they change its name up there from Greenhorn's Fate to Old Timer's Paradise. Then I'll condescend to take Chief Operator on the biggest ship they have. But I want a better place to live in, Captain."

"You may have the spare room, Blank old man. Take it and welcome. It has running water and a stanchion bed that you don't have to fold."

New York Coil Company's New Radio Frequency Transformers Are A Revelation

They operate on new wave lengths using loop, indoor aerial or antenna. Price $4.00. Many other new devices. Literature ready.

338 Pearl Street, N. Y. City, N. Y.



STATIC and Interference is reduced to a minimum

Better Reception with the NASSAU LOOP TUNER

TRADE MARK

Pat. Pend. Price $35.00 Jobbers and Dealers write for Proposition

Eliminates Aerial and Ground
The Secret is in the Patented Winding
1500 MILES ON LOUD SPEAKER
With 2 stages radio and 2 stages audio frequency amplification
Write for Circular "W"
Manufactured by
NASSAU RADIO CO., Inc.
60 Court St. Brooklyn, N. Y.

"COPPERWELD"

(Made by the Molten Welding Process)

ANTENNA WIRE

50% Stronger Than Copper

Better than copper or strands for aerials. Doesn't stretch or sag.

The permanently welded copper exterior makes it ideal because of "skin effect" phenomena of radio currents. Standardized by the largest manufacturers of radio equipments.

Sold everywhere
100, 150 and 200 feet per carton

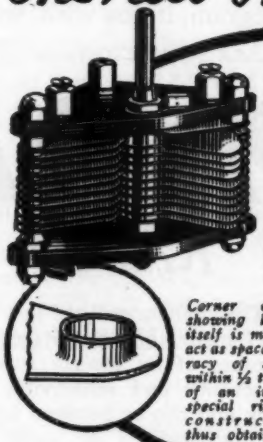
BUY IT IN CARTONS

"COPPERWELD"
THE IDEAL RADIO ANTENNA
COPPERWELD IS 50% STRONGER
than Copper, can be strung taut, stays up when other wires stretch and break, and gives 100% electrical efficiency.
COPPER CLAD STEEL COMPANY
BRADDOCK P. O. RANKIN, PA.
Directions for Antenna construction on reverse side of carton

COPPER CLAD STEEL COMPANY

NEW YORK SALES OFFICE: 30 CHURCH STREET, NEW YORK
CHICAGO SALES OFFICE 129 S. JEFFERSON ST., CHICAGO
MAIN OFFICE AND WORKS: BRADDOCK P. O. RANKIN, PA.

The new Pacent Condenser



The many superior features of the Pacent Condenser make it worth twice the price. Patented spacers, improved bearings, longer wave length range, greater selectivity and quality throughout, insure long, satisfactory service. Play safe—insist on PACENT.

Corner of plate, showing how plate itself is machined to act as spacer. Accuracy of spacing, within ½ thousandth of an inch, and special rigidity of construction are thus obtained.

Don't Improvise—

"PACENTIZE"

Write for Descriptive Bulletin W-7

PACENT ELECTRIC CO., Inc.
22 Park Place New York, N. Y.

A-B Battery Tester

The Jewell A-B Battery tester fills a need for a low priced but accurate portable instrument for checking battery voltages. Double reading 0-12-120 volts is the range usually supplied, which takes care of the "A" battery up to the lightest commonly used for receiving.

PRICE, $10.00

We were the first to supply a complete line of miniature radio instruments of uniform size. Ask your dealer or write to us for complete radio circular.

Jewell Electrical Instrument Co.
1650 Walnut Street Chicago

HERE!

Buy Only a Non-Selective Transformer

Good quality demands equal amplification for all frequencies within the voice range. The 3.7 to 1 ratio of the Type 231A amplifying Transformer gives maximum amplification without distortion, in multi-stage as well as in single stage amplifiers.

High ratio amplifying Transformers are selective—and selective transformers have a resonant peak that causes serious distortion.

The General Radio Co.'s type 231A Transformer is suitable for use with UV-201A, 201, 199, WD-11, 12 and tubes of similar plate impedance. $5.00

At your dealers, or direct from us; Two educational folders, "Quality Amplification," and "Quality Condensers." Ask your dealer or write us. Send for free Radio Bulletin 914W.

GENERAL RADIO COMPANY

Manufacturers of

Radio and Electrical Laboratory Apparatus

Cambridge, Massachusetts

r 5419

Which is your "Radio Face?"

You can pretty nearly tell by the listener's expression whether he's tuned in on a single circuit or the Paragon three-circuit receiver.

In these days of unlimited broadcasting on overburdened wave bands it's almost a certainty that you'll have jamming and mixed messages just so long as you stick to old style equipment.

But, with a Paragon three-circuit receiver you avoid those ear-splitting, face-twisting interruptions. You can tune in accurately and "hold the line" through an entire program, if you wish, without a break.

Ask some experienced amateur what he knows about

PARAGON

Reg. U. S. Pat. Off.

RADIO PRODUCTS

The amateur will tell you that the Paragon three-circuit receiver, because of its greatly superior selectivity and sensitivity, can pick and choose between broadcasting stations of about the same signal strength with less than one per cent differential.

This means that with a Paragon receiver you get what you want when you want it—complete messages and clear music from the station you tune in on, without interruption and jamming. Until you have listened in with a Paragon three-circuit receiver, you cannot guess the real pleasure and fascination of radio.

Long before broadcasting popularized radio with the general public, Paragon equipment was the choice of the experienced amateur. He will tell you today that if you want quality and satisfaction, Paragon Radio Products are the best and safest buy on the market.

An illustrated Catalog of Paragon Radio Products is Yours For the Asking

DEALERS — The Adams - Morgan Company has an interesting proposition to make to reputable radio dealers who believe in quality merchandise. Details on request.

ADAMS-MORGAN COMPANY
8 Alvin Ave., Upper Montclair, N. J.

Also Manufacturers of PARAGON	
Radio Telephone Transmitters	Amplifier Transformers
V. T. Control Units	Control Dials
Rheostats	Amplifiers
Potentiometers	Receivers
V. T. Sockets	Switches
Detectors	Variometers

Type RD-5 Regenerative Receiver and Detector—$75.00
Type A-2 Two-Stage Amplifier—$50.00
(Licensed under Armstrong Patents.)

Radio Advantages of bakelite dilecto

Laminated Phenolic Condensation Material

Highest Dielectric Strength

Resists Heat

Resists Water

Cannot Warp or Swell

Unharmed by Solvents and Milder Acids

Tough, Durable; yet Readily Machined

and many others

The Continental Fibre Co.
Factory: Newark, Delaware

Dealer Service from:

New York, 233 Broadway
Pittsburgh, 301 Fifth Ave.
Chicago, 332 S. Michigan Ave.
San Francisco, 75 Fremont St.
Los Angeles, 411 S. Main St.
Seattle, 95 Connecticut St.

X X

RADISCO RADIO PRODUCTS

The Radio Distributing Co.

Newark, New Jersey

U. S. A.

Learn the Code at Home with the Omnigraph

"Just Listen—The Omnigraph will do the teaching"

THE OMNIGRAPH Automatic Transmitter will teach you both the Wireless and Morse Codes—**right in your own home**—quickly, easily and inexpensively. Connected with Buzzer, Buzzer and Phone or Sounder, it will send you unlimited messages, at any speed, from 5 to 50 words a minute. **THE OMNIGRAPH** is not an experiment. For more than 15 years it has been sold all over the world with a money back guarantee. **THE OMNIGRAPH** is used by several Depts. of the U. S. Govt.—in fact, the Dept. of Commerce uses **THE OMNIGRAPH** to test all applicants applying for a Radio license. **THE OMNIGRAPH** has been successfully adopted by the leading Universities, Colleges and Radio Schools.

Send for FREE Catalog describing three models, $14 to $30. DO IT TODAY

THE OMNIGRAPH MFG. CO., 16B Hudson St., New York City

If you own a Radio Phone set and don't know the Code—you are missing most of the fun

FROM FACTORY TO YOU **ROYALFONE**

Matched tone, sensitive, adjustable head band, 5 ft. cord. Equal to any 3000 ohm $8.00 phone. Money back guarantee. If your dealer cannot supply you take advanatge of this special offer.

PRICE $3.75 C. O. D. OR MONEY ORDER

ROYAL ELECT. LAB., Market St, Newark, N. J.

Salesmen wanted

EMPIRE

Oiled Tubing

For perfect insulation in wiring radio sets use Empire Oiled Tubing, sometimes called "SPAGHETTI."

MICA INSULATOR CO.

Manufacturers

68 Church St. New York — 542 So. Dearborn St. Chicago

Works: Schenectady, N. Y.

2030-F

"ALL-AMERICAN" Amplifying Transformers

(RADIO AND AUDIO FREQUENCY)

Again Prove Their Superiority

in "NEUTRODYNE" and "REFLEX" Circuits

The use of "All-American" radio (Type R-10) and audio frequency (Type R-13, Ratio 10 to 1) amplifying transformers make possible the wonderful success of the single tube Reflex Circuit.

The "All-American" radio frequency transformers (Type R-10) having a non-magnetic core can be tuned, making them the most efficient radio frequency transformers for the Neutrodyne Circuit.

R-10 Radio Frequency (150-550 meters)	$4.50
R-12 Audio Frequency (Ratio 3 to 1)	4.50
R-13 Audio Frequency (Ratio 10 to 1)	4.75
R-21 Audio Frequency (Ratio 5 to 1)	4.75

Ask your dealer for FREE "All-American" Hand Book of Radio Hookups. If he cannot supply you, send two cent stamp for postage and name of your dealer.

ALL-AMERICAN

RAULAND MFG. CO.
200 No. Jefferson St., Chicago, Ill.

ALL-AMERICAN

DISTRIBUTORS
FOR THE
Radio Corporation of America
WOOLWORTH BUILDING — NEW YORK CITY

DELAWARE

GARRETT, MILLER & CO.
Radio Equipment
N.E. CORNER 4th & ORANGE STS.
WILMINGTON, DELAWARE

ILLINOIS

Complete Radio Supplies
LYON & HEALY
Visit Our Model Store
145 So. Wabash Ave. Chicago

TUSCOLA RADIO SUPPLY STATION
Dependable Radio Apparatus
TUSCOLA ILLINOIS

KENTUCKY

THE SUTCLIFFE CO.
INCORPORATED
Write for our Complete Radio Catalog
LOUISVILLE, KENTUCKY

MAINE

ATLANTIC RADIO CO., Inc.
Complete RCA *Service*
21 TEMPLE ST., PORTLAND, ME.

MARYLAND

JOS. M. ZAMOISKI CO.
19 NORTH LIBERTY STREET
BALTIMORE, MARYLAND

MASSACHUSETTS

ATLANTIC RADIO CO., Inc.
Complete RCA *Service*
727 Boylston St., Boston, Mass.

MICHIGAN

DETROIT ELECTRIC CO.
113 East Jefferson Av. Detroit, Mich.
Send for Catalog RCA *Established 1883*
Michigan's Largest Radio Supply House

MINNESOTA

STERLING ELECTRIC COMPANY
MINNEAPOLIS, MINN.

MISSOURI

WESTERN RADIO CO.
Dependable Merchandise from America's Greatest Manufacturers
BALTIMORE AT FOURTEENTH
KANSAS CITY, MO.

For Dependable Radio Goods
Satterlee
Electric Company
22 E. 9th St. Kansas City Mo.
Dealers Write Us
MISSOURI, KANSAS, OKLAHOMA

NEW JERSEY

NATIONAL LIGHT AND ELECTRIC COMPANY
Co-operative Merchandisers
289-291 MARKET STREET
NEWARK, N. J.

RADIO DISTRIBUTING COMPANY
Guaranteed Radio for Every Purpose
8 WEST PARK STREET
NEWARK, NEW JERSEY

TRI-CITY ELECTRIC CO.
52-56 Lafayette Street
NEWARK, N. J.

NEW YORK

J. H. BUNNELL and CO.
"The Old Reliable House"
32 PARK PLACE
NEW YORK
Send stamp for Radio Catalog 45-R

CONTINENTAL RADIO AND ELECTRIC CORP'N
New York's Leading Radio House
15 WARREN STREET
NEW YORK

GOTHAM ELECTRIC SALES CORP.
Standard Radio Material
15 West 35th Street
New York City

HOWELLS CINE EQUIPMENT COMPANY
Everything from the Antenna to the Phones
740 Seventh Ave., New York City

TIMES APPLIANCE CO., Inc.
Approved Radio Merchandise
Wholesale Only
145 WEST 45th ST. NEW YORK

LANDAY BROS.
A Complete Stock of R. C. A. Merchandise Always on Hand
311 Sixth Avenue, New York
Retailed at the 7 Landay Stores

E S & E G
ALBANY, N. Y. SCRANTON, PA.
ELMIRA, N. Y. READING, PA.
BUFFALO, N. Y. WILKES BARRE, PA.
Wholesale Distributors Only

R C A Distributors—Continued

NEW YORK

JAMES F. BURNS
ELECTRICAL WORKS
Dealers and Jobbers in All Kinds of Radio Supplies
442 STATE STREET
SCHENECTADY, N. Y.

NORTH CAROLINA

SOUTHERN RADIO CORP'N
The South's Largest Exclusive Radio Company
Located in
"The Radio Center of the South"
CHARLOTTE, N. C.

OHIO

THE MILNOR ELECTRIC COMPANY
Large Stocks—Quick Service
139 GOVERNMENT SQUARE
CINCINNATI, OHIO

FLEWELLING CIRCUIT

A continuously variable grid leak over a wide range of resistance is the most essential and critical instrument required in this circuit.

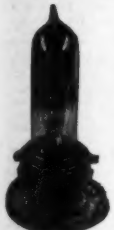
The BUNNELL VARIABLE GRID LEAK with a range of ¼ to 6 megohms fills the bill.

Furnished complete with japanned metal cover and screws for mounting. Without Cover, 70c. with cover, $1.00

Liberal discounts in quantities.

Send stamp for catalogue No. 45-W.

J. H. BUNNELL & COMPANY
32 Park Place New York City



Na-ald Special Socket No. 499
Price 50 cents

Na-ald De Luxe No. 400
Price 75 cents

It's the contact that counts

The Na-ald Special Socket No. 499 is a sturdy little socket with a dependable contact for the G. E. No. 199 dry-cell tube. It has special slot construction, and is moulded of genuine Bakelite. The heat from soldering connections will not affect Na-ald sockets.

The dual-wipe contact strips of the Na-ald De Luxe socket avoid the trouble experienced with the socket of conventional design. Because of thorough cure and high dielectric properties Na-ald sockets keep plate to grid losses at a minimum (of particular importance in Flewelling Circuit or in Radio Frequency).

Na-ald Adapter for No. 199 tube, $1.00

Booklet of selected circuits packed with each Na-ald product or sent in exchange for cover taken from any Na-ald carton.

ALDEN MFG. CO.
Manufacturers of Sockets for Every Tube and Requirement
Dept. A 52 Willow St.
Springfield, Mass.

RADIO PRODUCTS NA-ALD

PENNSYLVANIA

General Radio Corporation
10th and Cherry Sts. Philadelphia
806 Penn Ave. Pittsburgh

Special Service to Dealers on Radio Corporation of America Products, in Pennsylvania, New Jersey, Delaware, Maryland, District of Columbia, Virginia and West Virginia.

LUDWIG HOMMEL & CO
530-534 FERNANDO ST. PITTSBURGH, PENNA.
WHOLESALE EXCLUSIVELY
Hommel's Illustrated Encyclopedia of Radio Apparatus 225 E will be sent free to dealers.
We sell to no others.

PENN ELECTRICAL ENGINEERING CO.
Westinghouse Agent Jobbers
SCRANTON, PA.

THE PHILADELPHIA ELECTRIC COMPANY SUPPLY DEPT.
130-32 So. Eleventh St.
Philadelphia

"ESCO" BATTERY CHARGERS

To meet an insistent demand for

RUGGED—RELIABLE NEVERFAILING MOTOR-GENERATORS

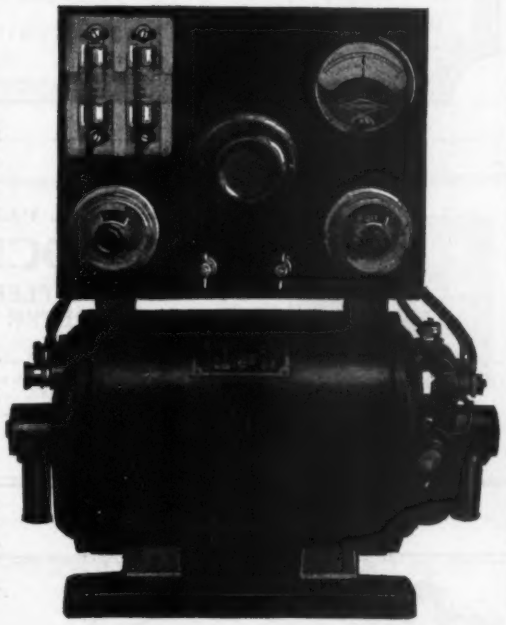
For charging batteries used in wireless operation, we have developed a complete line of

MANY SIZES

with or without panel boards.

"ESCO" QUALITY thruout. You know what that means.

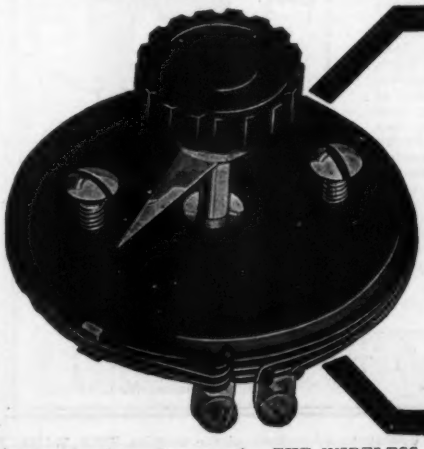
Ask for Bulletin 242



ELECTRIC SPECIALTY COMPANY

231 SOUTH STREET, STAMFORD, CONN., U. S. A.

Pioneers in developing Quality Wireless Apparatus



JEWELL Vernier Rheostat

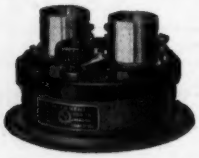
The Jewell vernier rheostat is extremely simple and substantial in construction, employing a new principle of contact which we have patented. Made of the highest grade bakelite and using the best resistance wire obtainable. Very fine adjustments are obtained by a single turn of the knob. Ask your dealer or write to us for special circular.

Price, $1.00

Jewell Electrical Instrument Co.
1650 Walnut St. Chicago

ATWATER KENT

RECEIVING SETS AND PARTS



If you are now working with a one-tube set, the 2-stage amplifier shown here will give you the necessary volume of sound to make a loud speaker possible.

It is a compact unit—transformers are sealed in the base so that no dampness can affect the working quality of the instrument. To demonstrate the damp-proof qualities, one of these instruments was soaked in a tub of water for several hours, then put into a circuit and tested for reception with perfect results.

Send for an illustrated folder showing all parts and complete sets.

ATWATER KENT MANUFACTURING COMPANY
4946 STENTON AVE. *Radio Dept.* PHILADELPHIA, PA.

RAINBOW MULTI-PLUG

Plugs in Antenna; Ground and A & B Batteries.
Make your wires as neat as your set.
Eliminates all binding posts.
Panel mounting is also made with cap and wires for standard sets.
Panel Mounting type $4.00 cpt.
Binding post type $5.00 cpt.

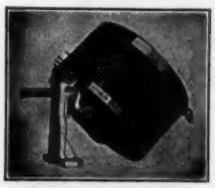
Cable 8 feet over all. 6 ft., 6 inches braided. 18 inches single conductors for connection to batteries.

Patents Applied for

For sale by all Dealers and Jobbers

HOWARD B. JONES
610 S. Canal St. Chicago, Ill.

Distributor for Ill. and Wis. Wireless Appliance Company, Chicago.



A WONDERFUL PAIR

SHAMROCK

180° VARIO-COUPLER *and* VARIOMETER

All tubes are GENUINE BAKELITE, wound with green silk covered wire

Distributors, Jobbers and Dealers write for attractive prices

SHAMROCK MANUFACTURING CO.
314-322 Market St. Dept. U Newark, N. J.

RADIO "BUGS" GET INTO BUSINESS FOR YOURSELF

Why not turn your hobby into money? You can easily make $15 a day, or as much more as you like, by our wonderful plan of selling Radio direct to the millions of people just waiting for our better parts or sets. We furnish everything you need at lowest factory prices and tell you how to build a profitable business of your own.
Knott products are up to the minute. Knott plans are unique and unbeatable. Radio is just beginning to come into its own. Are you? Want to make more money? Want to be your own boss? Write TODAY for FREE instructions How to Sell Real Radio.

E. R. KNOTT MACHINE CO.,
1-G Ellery St., S. Boston 27, Mass.

FIBERTONE

adds many new summer pleasures

There are a host of added pleasures you can get with your Fibertone horn this summer. On a far distant shore of a calm, clear lake; on the breeze-swept porch of a mountain cabin or shore cottage; on a day's outing with the automobile, or right on your own front lawn. Wherever it might be, you can be assured of the perfect amplification of "Broadway's music" brought direct to you. Just clamp one of your receivers on the base of the Fibertone and you have a wonderful loud speaker. Made of fiber to prevent metallic, vibrative noises. If your dealer cannot supply you write direct.

EIGHT DOLLARS

FIBER PRODUCTS COMPANY
240-A North 10th Street, - - - Newark, N. J.

Super-Sensitiveness!

The crystal is the "bull's-eye" of your crystal receiving set. Unless it is super-sensitive you are wasting time and entertainment and cannot "hit" the combination for best results. Insist upon the genuine original Arlington tested "NAA" Detector minerals. They are carefully selected from bulk stock, individually tested and guaranteed super-sensitive. Galena, Goldite or Silicon, price for crystal, 25c. Same mounted in brass cup, 40c. Obtainable at your dealer's or sent direct (postpaid) on receipt of price.

Newman-Stern Building Cleveland, Ohio

The Newman-Stern Co

RUSONITE

CRYSTAL RECTIFIER
MULTIPOINT (Patent Pending)

A synthetic **Crystal Detector** sensitive over its entire surface. Eliminates all detector troubles. Extraordinary clearness and volume. Endorsed by Radio experts and press. Sold in Sealed Packages only. Join the ever increasing Rusonite fans. Price, postpaid, mounted, sensitiveness guaranteed, **50c**

RUSONITE CATWHISKER 14 Karat Gold Multipoint contact super-sensitive.. **25c**
Order from your dealer or direct from us.
RUSONITE PRODUCTS CORP.
15 Park Row, N. Y. Dept. "W"

Take This With You On Your Vacation—

Those who plan a vacation with their radio set should include this 8 lb. charging device

Sterling
PORTABLE RECTIFIER

As easy to use as an electric iron. It cannot harm the plates. Tapering charge prevents overcharge. Very efficient.

Charges from any 110-120 A.C. Circuit.

List Price $16.00
West of Rockies $17.00
Trade Discounts

Write for complete bulletin of Radio Equipment

THE STERLING MFG. CO.
2545 Prospect Ave. Cleveland, Ohio

The Radiovox Company

Distributors of Radio Corporation and Western Electric Radio Apparatus

Operating Cleveland Broadcasting Station "WHK"

5005 Euclid Avenue
CLEVELAND OHIO

NOVO "B" BATTERIES FOR RADIO

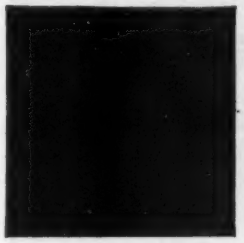
22½-45 & 105 VOLTS

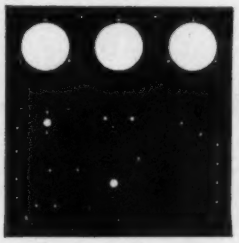
NOISELESS
DEPENDABLE
GUARANTEED

ASK YOUR DEALER

NOVO MANUFACTURING CO.
424-438 W. 33rd ST.
NEW YORK

531 SO. DEARBORN ST., CHICAGO.





BAKELITE **Condensite** **REDMANOL**

The United States Navy Department, the Signal Corps, and the leading Radio Manufacturers, without exception, have adopted our material in one form or another.
They use it because it's a standardized product of uniform quality, and because it is ideally adapted to the manufacture of radio apparatus.
In Laminated form its surface and volume resistivity are extremely high and the dielectric losses quite low as shown by the following Bureau of Standard Tests:

Properties	Hard Rubber	Laminated Phenolic Insulating Materials
Dielectric strength, volts / mm....	10,000 to 38,000	27,000 to 45,000
Tensile strength, lbs. per square inch	3,500 to 6,500	10,000 to 25,000
Water absorbed in twenty-four hours immersion, percentage of weight..	0.02	0.2 to 1.0
Thermal expansivity at 20 to 60 degrees Centigrade.....	60 to 80 x 106	20 to 30 x 106
Heat	At 65.5C. (150F.) hard rubber softens perceptibly; at 100C. (212F.) it is so soft it may be bent easily; at 115.5C. (240F.) it becomes leathery and may easily be cut with a knife; melts at 200C. (392F.)	Not readily inflammable; will withstand continuously temperature of 149C. (300F.). Heat tends to complete reaction and volatile substances are driven off.
Sunlight	Discolors and disintegrates after a few months; the sulphur of the hard rubber is oxidized, forming the equivalent of sulphuric acid; this may take up ammonia from the air or may attack the filling materials forming the various sulphates on the surface; the surface resistivity is greatly reduced.	No visible effect.

Divisions of
BAKELITE CORPORATION

BAKELITE
General Bakelite Co.
8 West 40th St. New York

Condensite
Condensite Co. of America
Bloomfield, N. J.

REDMANOL
Redmanol Chemical Products Co.
636-678 West 22nd St.
Chicago, Ill.

Our licensed fabricators are prepared to furnish radio parts molded from our products and also machined or engraved panels in large or small quantities at very reasonable prices. Names on request.

BAKELITE CORPORATION
Address the Divisions

The Material *of a* Thousand Uses

Sound Method of Learning the Code, 50c.
Wireless Press, 326 Broadway, New York.

HOMMEL FOR RADIO

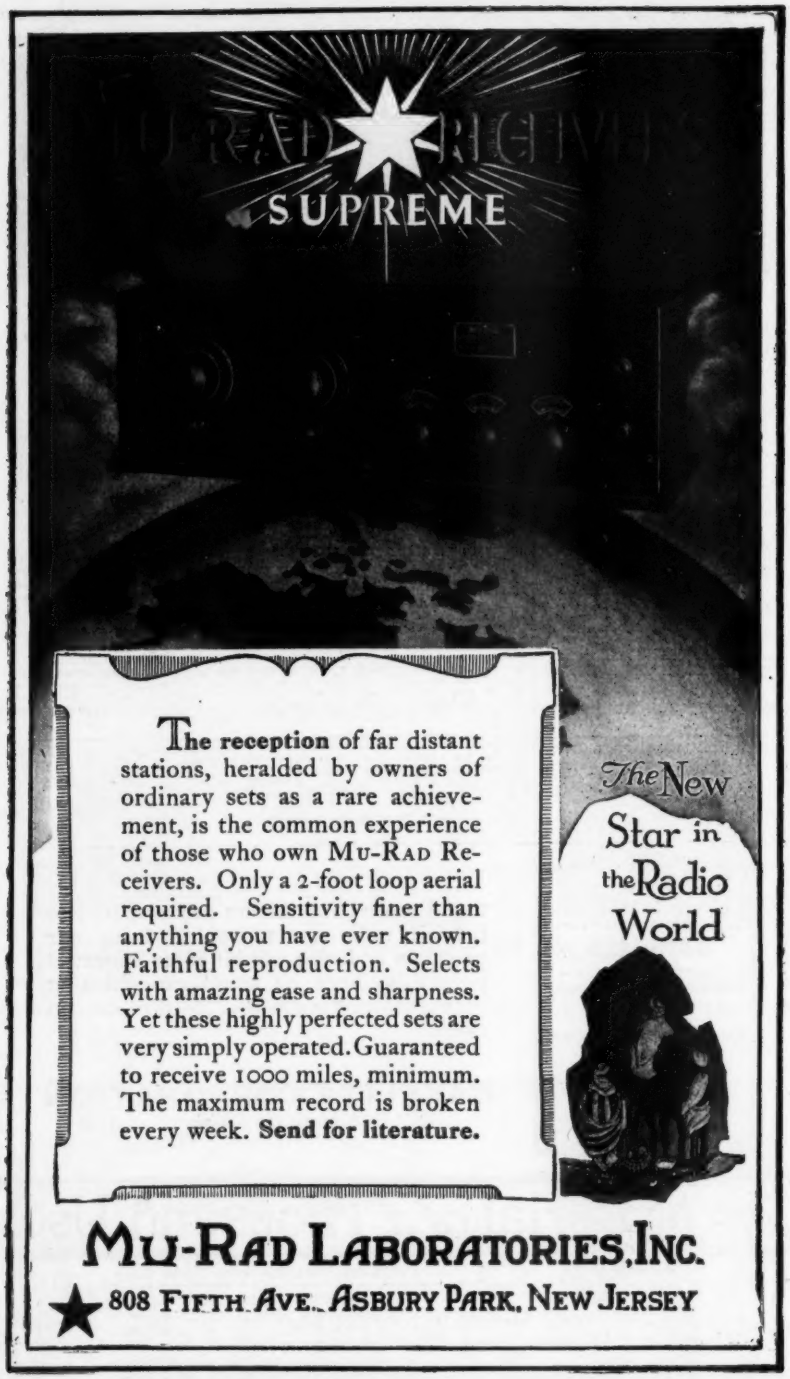
WHOLESALE EXCLUSIVELY

Radio Corp. of America	Bradleystat	Freshman	Pamet
Westinghouse	Brandes	Frost	Radiall
General Electric	Burgess	General Radio	Remler
Acme	Chelsea	Homecharger	Rhamstine
Atwater Kent	Cutler-Hammer	Kellogg	Western Electric
Baldwin	Dubilier	Kennedy	Westinghouse Union
Brach	Fada	Murdock	and others

Hommel's Illustrated Encyclopedia of Radio Apparatus 225E Free to Dealers

LUDWIG HOMMEL & CO

530-534 FERNANDO ST. — PITTSBURGH, PENN'A



The reception of far distant stations, heralded by owners of ordinary sets as a rare achievement, is the common experience of those who own MU-RAD Receivers. Only a 2-foot loop aerial required. Sensitivity finer than anything you have ever known. Faithful reproduction. Selects with amazing ease and sharpness. Yet these highly perfected sets are very simply operated. Guaranteed to receive 1000 miles, minimum. The maximum record is broken every week. **Send for literature.**

The New Star in the Radio World

MU-RAD LABORATORIES, INC.

808 FIFTH AVE., ASBURY PARK, NEW JERSEY

NEW CARTER VERNIER CONTROL RHEOSTAT

Simple, positive, distinctive and reliable. No scraping; no jerking; no friction bearing contacts; bronze springs; satin silver finish; clock spring pigtail connection insures positive and reliable operation.

Code 1, 6-ohm, for U. V. 200 type tube..$1.50 ea.
Code 1-C, 20-ohm, for U. V. 201 tube.... 1.75 ea.
Code 1-D, 30-ohm, for U. V. 199 tube.... 1.75 ea.

CARTER "TU-WAY" PLUG

Takes 1 to 4 head sets..$1.00 ea.
CARTER "HOLD-TITE" JACKS; phosphor bronze springs; wide tapered frame; no spacer washers.
CARTER CONTROL SWITCHES for every purpose.
CARTER RESISTANCE UNIT permits regular rheostats to operate new tubes.

No jobber's or dealer's stock is complete without Carter Products. Write for Bulletins.

CARTER RADIO COMPANY, 209 South State Street, CHICAGO

SMALL ADS OF BIG INTEREST

A MEETING PLACE FOR BUYERS AND SELLERS

Space in this department costs only 65 cents a line. Minimum space seven lines. Payable in advance.

RADIO GENERATORS — 500-Volt — 100-Watt, $23.50. High Speed Motors—Federal Phones, $5.50—Battery Chargers, $12.50. Motor Specialties Co., Crafton, Pittsburgh, Penna.

PATENTS—Send for form "Evidence of Conception" to be signed and witnessed. Form, fee schedule, information, free. Lancaster and Allwine, 289 Ouray Bldg., Washington, D. C.

LIGHTNING—Strange Battery Compound. Charges discharged batteries instantly. Eliminates old method entirely. Gallon free to agents. Lightning Co., St. Paul, Minn.

GREBE DISTRIBUTORS
for
Eastern Pennsylvania, Southern New Jersey and Delaware
Send for Booklet
Philadelphia Wireless Sales Corporation
1533 Pine Street Philadelphia

CHARGE YOUR BATTERY
(RADIO OR AUTO)
at HOME for a NICKEL
The HOMCHARGER
POPULARLY PRICED — PAYS FOR ITSELF
SEND FOR FREE BOOK
THE AUTOMATIC ELECTRICAL DEVICES CO.
119 W. THIRD ST. CINCINNATI, OHIO

Build Your Own
HAZELTINE
NEUTRODYNE
with
FREED-EISEMANN
Licensed Essential Parts

Complete wiring diagram, instructions, etc. sent in special container with patented essential parts. Three NEUTROFORMER COILS mounted on variable condensers, and DOUBLE NEUTRODON (as illustrated), sent for **$21.50.** Ask your dealer to show you these parts, as well as complete assembled five-tube Neutrodyne Set in mahogany cabinet, Model NR-5, **$150.**

Or send 25c for Neutrodyne Constructor which shows "How to Make the Neutrodyne"

FREED-EISEMANN RADIO CORPORATION
DEPT. F
255 Fourth Avenue New York
Licensed by I. R. M. Inc. Under Hazeltine Patents

"A Reason" for *Better Reception*

"THE BASCO Vernier Rheostat"—that's the reason for many a better working Radio outfit. Fine filament control—.015 of an ohm. Think of it! You'll never need finer regulation for any detector tube. Get the most out of your detector—it's the *heart* of your outfit. The BASCO Rheostat will do it. Smooth, positive control of even the most critical tube. Only one panel *hole* needed for mounting. See the BASCO Rheostat and other parts. If your dealer can't supply you write us direct.

Jobbers and Dealers! Write for particulars and name of nearest factory representative.

Briggs & Stratton Co.
Milwaukee BASCO PRODUCT Wisconsin

Summer Static Overcome

"Good-bye Aerial"

ANTENELLA

No aerial or antenna needed

All outside wiring, aerial, lightning arresters, switches and other inconveniences so inductive to static are eliminated.

Merely plug Antenella in any light socket and you can enjoy all Radio pleasures in any room in your home, apartment or hotel. No current consumed.

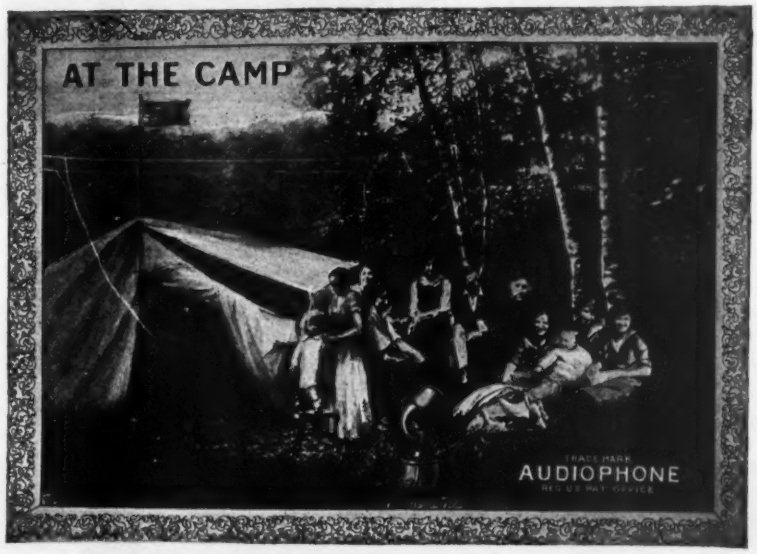
New Improved

ANTENELLA

NOW ONLY $1.25 formerly $2.00

At your dealers—otherwise send purchase price and you will be supplied postpaid.

Chas. Freshman Co. Inc.
Radio Condenser Products
106 Seventh Ave., New York



AUDIOPHONE AND CANOE both go to camp

Nobody wants to wear head phones during hot stuffy weather. A small efficient Loud Speaker ruggedly built will be welcome in any camp outfit. The AUDIOPHONE JR. is just the thing.

Light in weight and easily assembled or dismantled without tools. Doesn't require any battery. The tone quality is exceptional and enough volume to entertain the whole camp party.

See it at your dealers or write direct.

THE BRISTOL CO. WATERBURY, CONN.
Boston New York Philadelphia Pittsburgh
Detroit Chicago St. Louis San Francisco

Bristol AUDIOPHONE made in two sizes—

AUDIOPHONE SR.
Diameter of horn, 15 inches
Weight, 10 pounds
Price, $32.50

AUDIOPHONE JR.
Diameter of Horn, 11 inches
Weight, 7 pounds
Price, $22.50

Bulletin 3006-V describes them.

The Bristol Company,
Waterbury, Conn.

Please send me without cost or obligation to myself bulletins on Bristol Audiophone and One Stage Amplifier.

Name .....

Street and No. .....

City ..... State .....

WESTINGHOUSE

Radio "A," "B" and "C" BATTERIES

GETTING a station, especially on long-distance receiving, is only half the job. *Holding* it is the other half. The delicate adjustment requires constancy as well as accuracy. Batteries must be even-powered as well as full-powered; steady as well as lively; noiseless. Westinghouse Batteries are built for getting the very utmost out of your receiving set. The extra satisfaction you get will repay you many times for your determination to have nothing less than these carefully engineered storage batteries. What's more, their first cost is practically the last—for they'll last indefinitely and can be recharged repeatedly.

Westinghouse "A" Batteries are full-capacity, slow-discharge, long-life batteries. Made in 4, 6 and 8-volt sizes, with 5, 9 and 13 plates per cell, to meet various filament-battery requirements.

Westinghouse "B" Batteries The 22-MG-2 (22 volts) is a marvel for long, steady, noiseless service. Glass case; visible interior; sealed-in tops. Larger types, too; also 2-volt single "C" cells.

At Radio dealers and Westinghouse Battery Service Stations everywhere. Write for illustrated folder.

WESTINGHOUSE UNION BATTERY CO., Swissvale, Pa.

For summer receiving especially, you need the quiet, even performance of Westinghouse Batteries

For Camping and Vacation Use

WARREN RADIO LOOP

WITH a Warren Radio Loop you can easily take your present set with you to camp, shore or mountain, or you can build a very compact portable set. The Warren Loop fits inside a small cabinet and combines aerial and tuning device. All enclosed so that damp, dirt and rough usage cannot harm it. Various types according to your requirements. Write for Bulletin M 102.

A Type for Every Set at the Best Dealers

Type A-737 (300-700 meters) 6 inches square—non-directional $10

Type A-7236 (175-1,000 meters), 6 inches square—non-directional 12

Type B-2537 (300-700 meters), 18 inches square—directional 20

Type BL-2520 (200-18,000 meters), with honeycomb coil mounting, 18 inches square—directional 25

V-DE-CO RADIO MFG. CO.
ASBURY PARK, N. J.
Dept. W

LEARN THE CODE

Get all the fun there is to be had from your wireless set. Learn to read the dots and dashes and double your pleasure.

The Marconi-Victor Records

Provide the ideal instruction

SIX DOUBLE FACED RECORDS—TWELVE LESSONS

From the alphabet to press and code work. Actual operating conditions reproduced. Satisfaction guaranteed.

Price: $5.00 per set

WIRELESS PRESS, Inc., 326 Broadway, New York

Pruden Reliable Radio Specialties for Good Results

Dealers write today for our interesting proposition

Frederick H. Pruden, Inc.
993 Bergen Avenue
Jersey City, N.J.

Crosley Model X
The Height of Efficiency Price $55

For Sale by Best Dealers Everywhere.
Write for Catalog showing complete Crosley line.
New York Office: C. B. Cooper, 1803 Tribune Bldg., 154 Nassau St.
Boston Office: 929 Blue Hill Ave., Dorchester
Chicago Office: 1311 Steger Bldg., 28 E. Jackson Blvd., R. A. Stemm, Mgr.

CROSLEY MANUFACTURING COMPANY
728 ALFRED STREET, CINCINNATI, OHIO

Remarkable Regenerative Receivers

Ace Model V
$20
Formerly known as Crosley Model VC

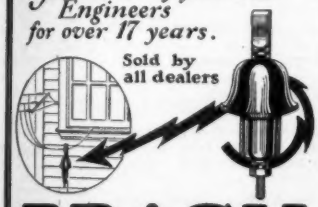
A Great Summer Seller

Licensed under Armstrong U. S. Patent No. 1,113,149. Copies stations more than 1,000 miles away regularly. Live Jobbers and Dealers are eagerly taking advantage of the sales this instrument brings them. Free Catalog on Request.

THE PRECISION EQUIPMENT CO.
Powel Crosley Jr. President
728 GILBERT AVENUE, CINCINNATI, OHIO

The choice of foremost Engineers for over 17 years.

Sold by all dealers



BRACH
VACUUM
RADIO PROTECTOR
Approved by the National Board of Fire Underwriters
Ask YOUR Insurance Agent

L. S. BRACH MFG. CO.,
Newark - New Jersey

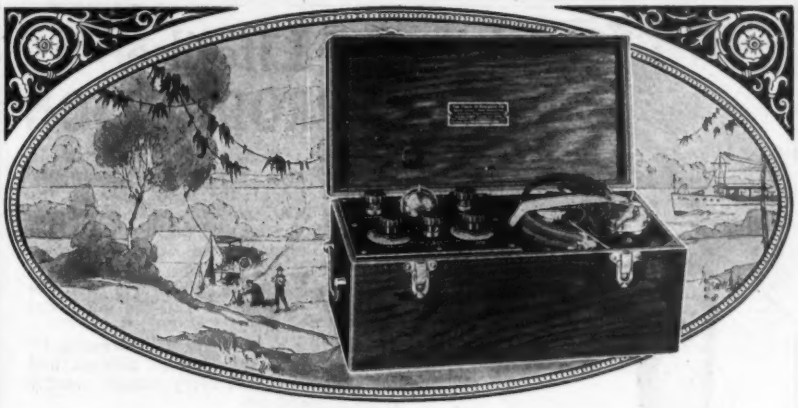
SOLDERALL
Metal in Paste Form

Handy Tubes 25¢
Every Electrical Connection Needs
Solderall for Perfect Reception.
The Only Convenient Metal Solder

GREGG & COMPANY
Engineers

Offer a fully equipped radio laboratory to manufacturers and consulting engineers interested in unbiased reports based on scientifically sound measuring methods. Operated by radio engineers of long experience it assures reports of great practical value.

165 Broadway New York



Take This Radio Set on Your Outings!

A New Kennedy Achievement—Light, Compact, Portable, Highly Efficient

A welcome addition to the camper's kit.

Take it with you wherever you go.

Here is the ideal Summer Radio Set! Just the thing to take with you on your vacation—auto touring, boating, camping, or to your summer cottage. A handy, compact set, so easily transported from place to place that you can take it with you wherever you go—yet so exquisitely finished that you will be glad to have it in your home.

Reduces Interference

This new set is the latest triumph of the Kennedy Engineering staff. It has all the beauty, refinement and perfection of detail that distinguishes the Kennedy line and makes it the "Royalty of Radio." It is simple to operate, yet highly selective, with unusual freedom from interference—the ideal summer set.

No Storage Battery Needed

The Kennedy "Portable" is designed for use with any standard tube, including the dry-cell type. When dry-cell tube is used, the set is entirely self-contained, space being provided in the sturdy, beautiful oak cabinet for dry batteries and phones. Size 15x7½x7, weight 17 lbs. Complete, with tube, dry batteries and phones, $75.00.

All Kennedy Receiving Sets are regenerative—licensed under Armstrong U. S. Patent No. 1,113,149

See the nearest Kennedy dealer for demonstration, or write for descriptive literature on this and other Kennedy sets.

THE COLIN B. KENNEDY COMPANY
SAINT LOUIS SAN FRANCISCO

KENNEDY
The Royalty of Radio

Tell your friends about THE WIRELESS AGE—
they'll enjoy it too.

Practical Radio Operating

Our laboratory has just been completely equipped with standard commercial spark and vacuum apparatus, including 2 K. W. panel set, S. E. 143 receiver, Western Electric power amplifier and other pieces too numerous to mention. Code room equipped with Kleinschmidt automatic transmitter. Thorough preparation for passenger and freight ship radio operator's position. Write today for our booklet.

"When in New York Pay Us a Visit" **Arc—Spark—Vacuum Tubes.**

Y. M. C. A. Radio School
"Best Radio School in the East"
149 East 86th Street **New York City**

Lifelike Re-PRODUCTION

Almost as though from the throat of the artist in the distant studio floats the vibrant tones of the song, actually re-PRODUCED, created anew, faultlessly duplicated through the marvelous musical—radio instrument—the *Atlas Amplitone.* Does *not* blast or distort.

Adjustable double diaphragm fits the *Amplitone* to your set and the individual receiving conditions.

Made like a fine musical instrument by the joint study and skill of acoustic and radio engineers. In every respect, worthy of your confidence.

With connecting cord and full instructions.

Atlas AMPLITONE LOUD SPEAKER

$25

Insist Upon the Atlas Amplitone

Only the Atlas Amplitone can Re-PRODUCE. If your dealer has none, ask him to order for you.

Atlas Amplitone Unit

The Atlas Amplitone, minus the horn and base, can be purchased separately for use with your own horn or for attachment to any phonograph (except the Brunswick) with phonograph attachment **$13.50**

Unit without attachment, $12.50

Write for Atlas Amplitone Book

This fully illustrated book describing this greatly advanced loud speaker and including a list of broadcasting stations, directions for improving reception, and the proper use of a loud speaker, and other valuable information from a widely known expert sent upon request.

Multiple Electric Products Co., Inc.
9 Orange Street RADIO DIVISION **Newark, N. J.**

I use non-metallic

HORNLESS

speakers, for producing exquisite music and soft speech from broadcasts.

This speaker is leaf-shape spruce set in mahogany. About a foot high and wide and four inches deep. Any ordinary two-pole telephone receiver giving LOUD speaker results, can be used to operate it, by removing the ear-cap and diaphragm. And it makes a good piano broadcast sound like a real piano.

I have some that can be delivered with directions, by parcel post, for $9.50 each.

R. H. Marriott, Bremerton, Washington

Crystal Tube Detector

Price $1.50

Replaces crystal and cat whisker. Always set and alive, loud and clear. No more fishing for live spots. *Guaranteed* to detect perfectly. Simple to connect—full instructions. *Needs no batteries* and never burns out. Made of the famous B-Metal. Sold by all live dealers or can be ordered from

THE B-METAL REFINING COMPANY
3134 Trumbull Avenue, Detroit, Michigan

Advertisers' Index

Adams-Morgan Co. 16
Alden Mfg. Co. 17
Allen-Bradley Co. 7
Andrea, Frank A. D. ..... Fourth Cover
Atwater Kent Manufacturing Company 2
Automatic Electrical Devices Co., The 16

B-Metal Co. 24
Bakelite Corporation 20
Brach Mfg. Co., L. S. 23
Brandes, C., Inc. 3
Briggs & Stratton Co. 21
Bristol Company, The 21
Bunnell & Co., J. H. 17
Burgess Battery Company 4

Carter Radio Co. 20
Continental Fibre Co., The 25
Continental Radio & Elec. Corpn. 14
Copper Clad 23
Crosley Manufacturing Co. 20
Cunningham, E. T. ..... Second Cover

Eiseman Magneto Corp. 13
Electric Specialty Co. 17

Fansteel Products Co. 11
Federal Telephone & Telegraph Co. 14
Fiber Products Co. 6, 23
Freshman Co., Inc., Chas. 21
Freed Eisemann Radio Co. 20

General Radio Co. 24
Gregg & Co. 23

Hommel & Co., Ludwig 23

International Correspondence Schools 27

Jewell Electrical Instrument Co. 24, 27
Jones, Howard B. 25
Jones Radio Company 5

Kellogg Switchboard & Supply Co. 4
Kennedy Co., The Colin B. 23
Knott Machine Co., E. B. 26

Marriott, R. H. 24
Magnavox Co., The 19
Mica Insulator Co. 25
Multiple Electric Products Co. 24
Mu-Rad Laboratories 26
Mydar Radio Co. 19

Nassau Radio Co. 25
Newman-Stern Co., The 26
New York Coil Co., Inc. 23
Novo Mfg. Co. 20

Omnigraph Mfg. Co., The 25

Pacent Electric Co., Inc. 23
Philadelphia Wireless Sales Corp. 20
Post Electric Co. 22
Precision Equipment Co. 20
Pruden, Frederick H. 23

Radio Corporation of America 1
Radio Corporation of America Distributors 26
Radio Distributing Co., The 25
Radio Institute of America 13
Radio Stores Corporation 15
Radiovox Company, The 23
Rauland Mfg. Co. 26
Royal Elec. Lab. 25
Rusonite Products Corporation 26

Shamrock Mfg. Co. 23
Shaw Insulator Company 3
Short Cut Radio Corp. 22
Sterling Manufacturing Co. 23

Thordarson Electric Mfg. Co. 3

V-DE-CO Radio Mfg. Co. 23

Westinghouse Union Battery Co. 23
Wireless Press, Inc. ..... Third Cover

Y. M. C. A. Radio School 23

SMALL ADS OF BIG INTEREST 28

Amateur Radio Stations of the United States

Supplementary List brought up-to-date from June WIRELESS AGE

First District

1 BB A. Hayward Carr, 17 Vinson St., Worcester, Mass.
1 BA Walter K. Shaw, Nashawtuc Road....Concord, Mass.
1 BR Perry F. Hadlock, Stern Road.....Wellesley, Mass.
1 BT Harold Alcalde, 42 Manchester Rd., Brookline, Mass.
1 BW Clinton W. Crandell, Jr., 4 Vesper Street, Worcester, Mass.
1 BX Norman E. Soules, 366 Central Ave., Norwich, Conn.
1 AFE Walton T. Crocker, 5 Salem St.....Reading, Mass.
1 AIA Leonard E. Moore.....Durham, N. H.
1 AIB José A. Buzzard.....Winsted, Conn.
1 AIG Robert W. Refuse, 38 Lincoln St....Norwood, Mass.
1 AYN Arthur H. Butler, 78 West Bow St..Franklin, N. H.
1 AET Paul H. Thibodeau, Bridge St.....Osterville, Mass.
1 BAB Ames R. Millett, 37 Morning St....Portland, Maine
1 BAV Napoleon J. Vachon, Box 69, RFD No. 1, Bowdainham, Me.
1 BAX James D. Booth, 609 Longmeadow St., Longmeadow, Mass.
1 BAY Richard W. Smith, 95 Maple Ave., Claremont, N. H.
1 BBA Ferdinand C. W. Thiede, 20 Woodward Ave., Quincy, Mass.
1 BBB Joseph H. F. Hickey, 190 Lexington St., E. Boston, Mass.
1 BBD Jack Norcross, 19 Cushman St.....Monson, Mass.
1 BBP Albion J. Goodwin.....Cape Neddick, Maine
1 BBG Allen W. Jones, 1411 Commonwealth Ave., Boston, Mass.
1 BBH Earl W. Houghtaling, 326 Lincoln St., Lowell, Mass.
1 BBL John H. Hills, 69 Massasoit St., Northampton, Mass.
1 BBO Harris Fahnestock, Jr.....Lenox, Mass.
1 BBQ John C. Davis.....Berkshire, Mass.
1 BBR Charles E. Kachele, 144 Paul Gore St., Jamaica Plain, Mass.
1 BBV Louis N. Waldhaus, 376 Anson St., Bridgeport, Conn.
1 BCB William T. Pooler, 33 Revere Street., Springfield, Mass.
1 BCK Webster E. Fisher, 26 Frederick Road, So. Braintree, Mass.

CHANGES OF ADDRESS

1 KI C. T. Wilson, 23 Ocean View Rd., Swampscott, Mass.
1 BT Gustave Lemieux, 50 Green Street....Berlin, N. H.
1 ACN George Dionne, 61 South Elm St.....Bristol, Conn.
1 AGE Wm. H. F. Loeffler, 51 Woodland St., Lawrence, Mass.
1 BDO E. F. Karklin, 2176 Centre St., E. Roxbury, Mass.
1 CHW Roger W. Dodd, 163 Main St.....Rockport, Mass.

Third District

CHANGE OF ADDRESS

3 AY Cole, Jesse J., 5927 Girard Ave...Philadelphia, Pa.
3 BI Pearson Roland D., Culver Lake, Branchville, N. J.
3 FC Gray, Karl F., 1949 Lehigh St....Easton, Pa.
3 IT Hook, Ernest S., Glen Ave., east of Park Heights Ave., Menlo Pk., Baltimore, Md.
3 JZ Lewis, John B., 7941 Frankford Ave., Holmesburg, Philadelphia, Pa.
3 QG Showell, Emerson T., Ohio Ave.....Absecon, N. J.
3 MI Tupman, Sherrard C., 1347 Randolph St., N. W., Washington, D. C.
3 AMP Keller, Henry L., 272 Lewis St.....Staunton, Va.
3 ATJ Rehrer, Richard L., R. F. D. No. 5..Lancaster, Pa.
3 AUR Gettings, R. L., 20 W. Washington Ave. Washington, N. J.
3 AVT Schell, Edmund J., 743 Corinthian Ave., Philadelphia, Pa.
3 AWM Trethar, William J., 123 W. Weaver St., Philadelphia, Pa.
3 BAB Dorn, Frank F., Jr., 1716 N. 13th St., Philadelphia, Pa.
3 BAY Braddock, Edward, 8 Tanner St...Haddonfield, N. J.
3 BFK Miller, Alfred, 6429 Jefferson St., Philadelphia, Pa.
3 BOB Money, Harry W., 5537 Walton Ave., Philadelphia, Pa.
3 BKC Yates, H. M., 700 7th St., S. W., Washington, D. C.
3 BND Rowe, Charles R., 1636 Kenyon St., N. W., Washington, D. C.
3 BOK Gares, Lester F., 237 Mill St.....Bristol, Pa.
3 BVE Smith, Howard H., 1019 N. Park Ave., Haddon Heights, N. J.
3 BVD Myers, Donald, 5814 Hazbrook St..Philadelphia, Pa.
3 BWB Oppenheimer, Walter L., 105 Towanda Ave., Melrose Park, Pa.
3 CKB Eubank, Robert N., 2817 Montrose Ave., Richmond, Va.
3 CKJ Fugazzi, Frank, 847 Upshur St., N. W., Washington, D. C.
3 CKY Raysbrook, Richard, 3350 N. Park Ave., Philadelphia, Pa.
3 CCM Moore, Terris, 540 Mansion Ave., Haddonfield, N. J.

CORRECTIONS

3 ACN Doehne, Geo. V. and Robt., Oakwood Bd. and Locust Lane, Harrisburg, Pa
3 ACQ Evans, Leslie R., 272 LeCato Ave., Audubon, N. J.
3 CKV Cross, Alvin W., 926 Maple Ave., Collingswood, N. J.
3 CPX Harper, John C., Talbot St.....St. Michaels, Md.
3 CPY Wagstaff, Robert E., R. F. D. No. 1, Herndon, Va.
3 CPZ Erb, G. Donaldson, 346 Bridge St., Phoenixville, Pa.
3 CQA The Episcopal Academy .....Overbrook, Pa.
3 CQB Perdue, Polk, 1411 "U" St., N. W., Washington, D. C.
3 CQC Kelly, Robert L., Druid Hill Park, Baltimore, Md.
3 CQD Fear, Louis W., Jr., Main Road....Denville, N. J.
3 CQE Mayor, Brantz, 104 Mercer St., Princeton, N. J.
3 CQF Lloyd, Rupert A., 27 County St.....Phoebus, Va.
3 CQG Reedy, Frank V. O., 118 Washington St., Milford, Del.
3 CQH Newbold, W. Herbert, R. F. D. No. 1, Langhorne, Pa.
3 CQI Harbaugh, Raymond W., R 4, Box 144, Waynesboro, Pa.
3 CQJ Henninger, Stanley C., 216 E. Railroad St., Summit Hill, Pa.
3 CQK Windsor, Robert C., 414 N. Arlington Ave., Baltimore, Md.
4 AI Goings, Dollies, 307 Perkins St.....Rome, Ga.
4 CD Pierce, Charles L., 500 Courtland St., Atlanta, Ga.

Fourth District

3 QV Wheeler, Fred, 1404 LaRua St., Pensacola, Fla.
4 QE Torres, Jose M., 94 Mayor St., Ponce, Porto Rico.
4 QF Transou, Charles B., 390 Greenwood Ave., Atlanta, Ga.
4 QG Godwin, Thomas M., 909 DeSoto St., Pensacola, Fla.
4 QH Ryder, George H., Box No. 464.....Canton, N. C.
4 QI McLaneon, Charles L., Belvedere Road, W. Palm Beach, Fla.
4 QJ McClung, Marshall L., 130 E. Second St., Jacksonville, Fla.
4 QK Hartsfield, Raymond A., 245½ North Main St., Winston-Salem, N. C.
4 QL Thompson, John M., 834 Dekota St....Tampa, Fla.
4 QM Cooper, James L., 207 W. Charlton St., Savannah, Ga.
4 QN Griffin, John M., 214 Hide Park Place, Tampa, Fla.
4 QO Shumate, J. R., Jr., 600 E. Clay St., Thomasville, Ga.
4 QP Hutson, Ernest.....Palmetto, Ga.
4 QQ Rodenheimer, William K., 935 W. Bank St., Winston-Salem, N. C.
4 QR Davis, Newell B., 580 E. Call St., Tallahassee, Fla.
4 QS Knowles, William H., Jr., Harbourview, Pensacola, Fla.
4 QT Moore, Marcus S., 423 E. Cervantes St., Pensacola, Fla.
4 QU Archibald K. Pooley, 600 North Hayne St., Pensacola, Fla.
4 QW Richardson, Lonnie C., 312½ Scott St., Tampa, Fla.
4 QX David C. Walker, 836 E. Anderson St. Savannah, Ga.
4 QY William F. Grogan, 213 Garrett St., Fort Myers, Fla.
4 QZ Juan L. Casellas, 5 Fernandez Ave., San Juan, Porto Rico.
4 RA George H. Fischer, Jr., 1650 Dallwood Ave., Jacksonville, Fla.
4 RB Vincente Roure, Jr., 14 Brumbaugh St., Rio Pedras, Porto Rico.

CORRECTIONS

4 LO Dixon, Monroe S., 124 Jefferson St., Decatur, Ga.

Fifth District

5 AKX Joseph Todd Collins, 1821 Line Ave...Shreveport, La.
5 AKY Wm. Fred Kitchens, 1505 Roosevelt St...El Paso, Tex.
5 AKZ John T. Porter, Mich. Ave. and 13th St., Alamocordo, New Mex.
5 ALA Wm. Elliott Huddleson, 704 Caldwell St., Conway, Ark.
5 ALB Raymond Wesley Goddard, 1023 Cumberland St., Little Rock, Ark.
5 ALC Hamlin K. McWilliams, 305 S. Madera St., Eastland, Texas
5 ALD Kenneth B. Woodford, Runnells St...Big Spring, Tex.
5 ALE Richard Wilkins Dickerman, 214 N. Benton St., Gainesville, Tex.
5 ALF Newell B. Anderson.....Tomball, Texas
5 ALG Howard Clifton Zimmer, Quarters T 43 A., Ft. McIntosh, Laredo, Tex.
5 ALH J. P. Metcalf, 504 West Sixth St.....Bristow, Okla.
5 ALI Rae Allen Egbert.....Grand Saline, Tex.
5 ALJ Waring Hamilton & J. T. Snyder, 1462 Arabella St., New Orleans, La.
5 ALK Harvey A. Munroe.....Flatoria, Tex.
5 ALL Burnett M. Fraser, 529 Connolly St., Sulphur Springs, Tex.
5 ALM Roger J. Conant, 3715 Graustark St....Houston, Tex.
5 ALN Paul Schmitz, 909 N. 20th St.....Ft. Smith, Ark.
5 ALO Sanford C. Gladden, Box 44.....University, Miss.
5 ALP Harold A. Regan, 209 Plum St.N. Albuquerque, N. M.
5 ALQ Leo A. Miller, 718 S. 3rd St....Albuquerque, N. M.
5 ALR Robert E. Shelby, 1114 W. 9th St.....Austin, Tex.
5 ALS Willie E. Stafford, 1601 N. Zarzamora St., San Antonio, Tex.
5 ALT Wirt E. Ballard, 1010 Fair St.....Franklin, Tenn.
5 ALU Hubert R. Lynch, 220 E. 4th St.....Edmond, Okla.

Sixth District

6 CE Alexander Stokes, 2812 38th Ave., Oakland, Calif.
6 MM Richard A. Warner, 775 19th Ave., San Francisco, Calif.
6 AEA Geo. P. Bell, 5205 Cole St. .....Oakland, Calif.
6 ASM Chas. D. Molton, 1919 San Pablo Ave., Oakland, Calif.
6 CGU Albert Moorhead, Jr.....Ben Lomond, Calif.
6 CHE Jack A. McCullough, 2161 23rd St., San Francisco, Cal.
6 CHL Bartholomew Molinari, 3948 26th St., San Francisco, Calif.
6 CKK Arthur Wm. Kaufmann, "Oak Glen".Olympia, Calif.
6 CKL F. C. Alexander.....Yosemite, Calif.
6 CKM Mrs. Genevieve Doig, 2133 Columbia St., San Diego, Calif.
6 CKO Ben Harper, Lincoln & Bowdoin Sts.,
6 CKP Alfred Soulages, 1101 Santa Clara Ave., Alameda, Cal.
6 CKQ Howard Clausen, 1004 Grand Ave., So. San Francisco, Calif.
6 CKR Robert Giordanino, 1411 St. Charles St., Alameda, Calif.
6 CKS Irving Krick, 479 Forest St.....Oakland, Calif.
6 CKT Theodore Lewis, 962 Spence St.....Los Angeles, Calif.
6 CKV Orin H. Brown, 399 So. 14th St.....San Jose, Calif.
6 CKW Donald Sandilands, Center St.....Anaheim, Calif.
6 CKY Samuel Marks De Bolt, Jr.....Pioche, Nevada
6 CKZ Wm. Schlab, 1629 Vineyard Ave..Los Angeles, Calif.
6 CLA Leland E. Weaver, 956 23rd St.....Ogden, Utah
6 CLB Robert C. Bobson, 844½ N. Virginia St..Reno, Nev.
6 CLC Anthony Gomes, 1825 E. 17th St....Oakland, Calif.
6 CLD Elmer Weller, 530 21st St. .....Ogden, Calif.
6 CLE Fred Vogel, 2361 E. 22nd St.....Oakland, Calif.
6 CLF Junior Patterson, 2164 Jefferson St....Ogden, Utah
6 CLG Carl Vierra, 2445 24th Ave.....Oakland, Calif.
6 CLH Rudolph A. Christenson, 2324 23rd St., Oakland, Cal.
6 CLK John R. Knight & G. H. Lavender....Willows, Calif.
6 CLL Sage L. Kjelby, 866 Roosevelt St., Salt Lake City, Utah
6 CLM Wm. A. Winnegar.....Mountain View, Calif.
6 CLN Gilbert Dahlin.....Escalon, Calif.
6 CLO Barney Burke, 414 Backer St.....Fresno, Calif
6 CLP Lester Fry, Box 64 .....Empire, Calif.
6 CLR James Cornell, 2309 Haste St.....Berkeley, Calif.
6 CLS John I. Steventon, 4147 26th St...San Francisco, Calif.
6 CLT Alexander Austin, 2944 Avalon Ave..Berkeley, Calif.
6 CLU Walter A. Collidge, 534 O St.....Fresno, Calif.
6 CLV Lloyd Vernon Broderson, 155 Marston St., San Francisco, Calif.
6 CLW Rolland Elrod, 1645 Cedar St.....Berkeley, Calif.
6 CLX Uvay G. Ferry, 1926 Whitmore Ave..Los Angeles, Cal.
6 CLY Arnold M. Richard, 2177 Allston Way..Berkeley, Cal.
6 CLZ Edward Doell, 2131 Grant St.....Berkeley, Calif.
6 CMA Manuel Del Rosario, 119 North C St., San Mateo, Cal.
6 CMB R. P. Thompson, 847 Edgecliff Drive..Los Angeles, Cal.
6 CMC Walter Jakobs, 326 Faxon Ave..San Francisco, Calif.
6 CMD Joe West Brooks, 1323 P St.....Fresno, Calif.
6 CME Wm. Johnston, 156 King St.....Santa Cruz, Calif.
6 CMF Akira Omoto, 11 Wilmet St.....San Francisco, Calif.
6 CMH Kam Yau Hoo, 1977-6 Pauoa Road..Honolulu, T.H.
6 CMK Wm. H. Clark, 2068 Lombard St..San Francisco, Cal.
6 CLI Kenneth R. Unger, 210 E. First St., Salt Lake City, Utah

Seventh District

7 ED J. H. Wendell, 36 Division St. ....Arlington, Wash.
7 AHU Wm. W. Maitland.....Bluff Point, Alaska
7 AKB James Stormont Ramsay, 215 E. 9th St., Ellensburg, Wash.
7 AKC Lloyd Earnest Taylor, 733 Cebb St..Rosebury, Oregon
7 AKD Chas. Huntley, 6555 19th Ave.....Seattle, Wash.
7 AKE Chas. Melander, 702 Campus Ave....Pullman, Wash.
7 AKF Bert Edward Cushney.....Sunnyside, Wash.
7 AKG Bernard P. Harrimann, 518 Second St., Oregon City, Oregon
7 AKH C. B. Wood, 1301 Villard St....McMinnesville, Ore.
7 AKI David R. Scott, 1409 Garfield St.....Laramie, Wyo.
7 AKJ John T. Turner, Bellingham Nat'l Bk. Bldg., Bellingham, Wash.
7 AKK Richard P. Farrington, Briarwood Station, Portland, Oregon
7 AKL Ted Young, 628 Ferry St.....Albany, Ore.
7 AKM David Lombard.....Malden, Wash.
7 AKN Byron Harold Monish.....Saint Helens, Ore.
7 AKO Vergil Brittain, 1043 E. 8th St., N., Portland, Ore.
7 AKP Wesley Colbon, 914 Manhattan Ave., Arlington, Wash.
7 AKQ P. T. Ellis, 1075 Davision St.....Portland, Ore.
7 AKR John Yoho, 590 Benton St.....Portland, Oregon
7 AKS Charles J. Fisher, 1049 Cleveland Ave., Portland, Ore.
7 AKT Juel H. Lensch, 875 The Alameda...Portland, Ore.
7 AKU Edmund Rissberger, 1010 11th St...Oregon City, Ore.
7 AKV M. S. Salmonson, 1029 E. 21st St., N., Portland, Oregon
7 AKW Leonard W. Harrington, 417 Allaghany St., Portland, Oregon
7 AKX Jacob P. Smith, 1023 W. Birch St., Walla Walla, Wash.
7 AKY R. O. Rasmussen, Route 1, Box 631, Portland, Ore.
7 AKZ Lewis Clark Kiser, 1819 E. Morrison St., Portland, Oregon
7 ALA Jefferson High School Club, Commercial St., Portland, Ore.
7 ALB Jas. J. Brady, 10th & Water Sts., Oregon City, Ore.
7 ALC Richard Jordan, 899 E. Burnside St..Portland, Ore.
7 ALD Ralph O. Lyons.....Forest Grove, Oregon
7 ALE L. V. McMoran, R. F. D. 1.....Mt. Vernon, Wash.
7 ALF Clyde Dewey Blomgren.....St. Johns, Oregon
7 ALG G. W. Miller, R. 3, Box 249.....Portland, Oregon
7 ALH John Kenneth O'Connor, 998 NE 17th St., Portland, Oregon
7 ALI Jas. W. Wallace, R. F. D. 2, Box 180, Mt. Vernon, Wash.
7 ALJ George Beckett, 3323 S. 10th St.....Tacoma, Wash.
7 ALK Francis Beaulieu, 700 1st Ave.....Havre, Mont.
7 ALL Thomas U. Dorsey, 475 Schuyler St.....Portland, Ore.
7 ALM Homer W. Robinson.....Powers, Oregon
7 ALN Raymond N. Sherrod.....Powers, Oregon
7 ALO Harold W. Nelson, 701 Kilchitsas.....Oregon
7 ALP E. W. Snell.....Arlington, Oregon
7 ALQ Donald T. Wright, 304 Marquette St., Portland, Ore.

Eighth District

8 DHA Ralph H. Stroth, 1116 E. 125th St., Cleveland, Ohio
8 DHB Edward E. Huffman, Gray Apts. 2nd St., Elyria, Ohio
8 DHC Norris L. Urban, 517 N. Market Ave., Canton, Ohio
8 DHD Robert S. Betten, 3 The Circle .....Ithaca, N. Y.
8 DHE Courtney H. Wenger, 822 Gilmore Ave., N. W., Canton, Ohio
8 DHF Albert E. Coatsworth, 727 Northumberland Ave., Buffalo, N. Y.
8 DHG Joseph P. Weiss, 3902 Carson St....Pittsburgh, Pa.
8 DHH Charles Theel, R. F. D. No. 3.....Yale, Mich.
8 DHI John C. P. Lewis, 729 Amherst St., Buffalo, N. Y.
8 DHJ Howard L. Roe, 7341 Finance St.....Pittsburgh, Pa.
8 DHK John H. Hackenberg, 915 Madison Ave., Columbus, O.
8 DHL Ezekiel S. Dorsey, Jr., 14 N. Bouquet St., Pittsburgh, Pa.
8 DHM Alan F. Burgess, 121 S. Cedar St., Owosso, Mich.
8 DHN Joseph H. Barclay, Jr., 1332 Pritchard St., Pittsburgh, Pa.
8 DHO Burton C. Carpenter, 228 Delaware St., Syracuse, N. Y.
8 DHP Mark S. Richards, 117 S. Blakely St., Dunmore, Pa.
8 DHQ David L. Perrot .....Chesaning, Mich.
8 DHR Clyde H. Phelps, 22 Carverridge St., Canton, N. Y.
8 DHS Eugene G. Livingston, 314 Broadway..Findlay, Ohio
8 DHT Clifford R. Ringle, 341 Freeport Ave., Aspinwall, Pa.
8 DHU Everett B. LeFevre, 401 E. John St., Maumee, Ohio
8 DHV Henry Glenmore Oakes, R. F. D. No. 2, Mauch Chunk, Pa.
8 DHW Howard R. Zinso, R. F. D. No. 2.....Yale, Mich.
8 DHX Herbert Sherman, 46 Ellenwood Ave., Youngstown, Ohio
8 DHY DeWayne L. Howe, 49 Florida Ave., Youngstown, Ohio
8 DHZ Cole Frantz, 121 Park Place.....Kingston, Pa.
8 DIA Paul S. VanDeusen, 327 S. Willow St., Kent, Ohio
8 DIB Allen B. West, 426 N. Walnut St., Wilmington, Ohio
8 DIC Rodney Melhuish, Jr., 29 Goodwin St., Kingston, Pa.
8 DID Charles E. Merritt.....Westmoreland, N. Y.
8 DIE Leonard J. Peters, 19415 Phillips Ave., Cleveland, Ohio
8 DIF Robert Goettmann, 1122 Davis Ave., Pittsburgh, Pa.
8 DIG Clarence H. Baird 329 S. Richardson Ave., Columbus, Ohio
8 DIH Herbert I. Schmitt, 4458 Canton Ave., Detroit, Mich.
8 DII Arthur F. Turner, 7463 Kipling Ave., Detroit, Mich.
8 DIJ Robt. W. MacGregor, Jr., 231 N. Jefferson St., Dayton Ohio

8 DIK Frank T. Gibbs, Main St. ....Westmoreland, N. Y.
8 DIL Henry W. Gilmore, 26 Washington St., Ypsilanti, Mich.
8 DIM George Russell, Jr., 293 Kedder St., Wilkes-Barre, Pa.
8 DIN Walter B. Russell, 428½ 9th St., Niagara Falls, N. Y.
8 DIO James J. Sella, 1946 W. Liberty Ave., Pittsburgh, Pa.
8 DIP Stanley M. George .....Reesville, Ohio
8 DIQ William J. Titzel .....Glenshaw, Pa.
8 DIR William H. Allen, 391 W. Water St., Elmira, N. Y.
8 DIS Archibald E. Newton, 840 N. Main St., Jamestown, N. Y.
8 DIT Harold Keith, 221 Junction Ave., Detroit, Mich.
8 DIU Carl F. Bonbright, 812 St. Nichols Ave. Dayton, Ohio
8 DIV Lyle Dusenbury, 111 Lafayette St., Pontiac, Mich.
8 DIW Robert G. Teese, 4945 Marburg St., Cincinnati, Ohio
8 DIX Harold B. Neice, 24 W. Ogden Ave., Columbus, Ohio
8 DIY Jesse R. Leach, 306 S. Main St. .....Clyde, Ohio
8 DIZ John V. Heisch, 511 Carolyn Ave., Bellevue, Pa.
8 DJA David Stein, 3012 Lawrence St.....Toledo, Ohio
8 DJB Nelson C. Lewis, 2921 Urwiller Ave., Cincinnati, Ohio
8 DJC Karl Hukhizer, 303 S. Main St., Granville, Ohio
8 DJD Dwight Richards, 1372 Eastwood St., Columbus, Ohio
8 DJE Louis Coll, 627 Broadway.....Buffalo, N. Y.
8 DJF Harry S. Beriecsky, 120 Park Ave., Barberton, Ohio
8 DJG Palmer M. Wetz, 2020 Salem Ave., Dayton, Ohio
8 DJH Benjamin Bartzoff, 3 Norway Park, Buffalo, N. Y.
8 DJI George H. Matchett, 19125 Nottingham Rd., Cleveland, Ohio
8 DJJ Theodore Richards, 1737 E. Tuscarawas St., Canton, Ohio
8 DJK Charles Butterfield, 10 Conewango Place, Warren, Pa.
8 DJL Paul L. Shellhorn .....Lykens, Ohio
8 DJM Harold E. Warren, 40 McGraft St., Muskegon, Mich.
8 DJN Victor E. Rehark, 2940 Noble St., Cleveland Hgts., Ohio
8 DJO Clyde H. McKelvey, 1110 Ridge Ave., Latrobe, Pa.

Re-assigned calls—cancels previous issues.

8 BI Beatrice E. Bourne, 859 Washington St., Dayton, Ohio
8 BCT William H. Quelch, 606 Pennsylvania St., Oakmont, Pa.
8 BFZ Kenneth L. Brown, Raymond Blumenthal, 6221 Crane Ave., Detroit, Mich.
8 BGI Wayne Peterson, 166 Michigan Ave., Battle Creek, Mich.
8 BIP Ray A. Moore, 950 Kirbert Ave., Cincinnati, Ohio
8 CGP Carnegie Institute of Technology, Schenley, Pittsburgh, Pa.
8 CJK Carter McCormick, Chapman St., Chesaning, Mich.
8 CXS Roger W. Eismann, 305 Peach St. .....Erie, Pa.

Ninth District

9 AAE Dwight O. Nichols, 935 60th St.....Chicago, Ill.
9 ADM J. F. Cervenyak, 12 E. Chicago Ave., Chicago, Ill.
9 AER Bradford W. Hutson, 1112 Elmwood Ave., Wilmette, Ill.
9 AHA A. Gerald Sayre, College St. (P. O. Box 925), Milton, Wisc.
9 ALL Kenneth E. Goss, 9756 Prospect Ave....Chicago, Ill.
9 AMA Vincent J. Wolf, 1480 Webster Ave....Chicago, Ill.
9 AND Harold L. Beeson, 6129 Hermitage Ave., Chicago, Ill.
9 ANG William P. Yancey, 1625 Ripley St., Davenport, Iowa
9 ANK Edward F. Beckman, 3239 S. Paulina St., Chicago, Ill.
9 ANL Thurber G. Bombaugh, 11427 S. Church St., Chicago, Ill.
9 ASV Archie D. Thomas, R. R. No. 2, Box 2, Connersville, Ind.
9 ASW John Oigard, 977 Central Ave.....St. Paul, Minn.
9 ASX Laurence Robinson, 125 Jefferson Rd., Webster Groves, Mo.
9 ATF Oliver E. Zander, 364 First Ave....Milwaukee, Wisc.
9 ATH Harold M. Biebel.....Belleville, Ill.
9 AUD George M. Smith, 3710 Washington Blvd., Indianapolis, Ind.
9 AVW Thomas L. Gillespie, 1215 Tenth St., Lawrenceville, Ill.
9 AXB Charles M. Bennett.....Aurora, S. D.
9 AZV Harrison Haskins, 1137 Chicago St., Green Bay, Wisc.
9 AZW Henry A. Whitcomb, N. Main St., P. O. Box 258, Virgil, Kans.
9 AZY Everett Carter, 2114 Washington Ave., Granite City, Ill.
9 BGX Vernon Dennis .....Oskaloosa, Kans.
9 BOL Robert A. Prehm, 1322 LaSalle Ave., Minneapolis, Minn.
9 BSY Lawrence I. Barbier, 500 Burr Oak Ave., Homewood, Ill.
9 BYY Clifford Gustafson, 3715 Pleasant Ave., Minneapolis, Minn.

CHANGES

9 AE Robert N. Jones, 309 Linn St.....Boone, Iowa
9 ADE Charles E. Gutke, 3906 Lafayette St...St. Louis, Mo.
9 ADV John H. Willems.....Monica, Ill.
9 ADY Charles H. Atchisson, 6274 Famous Ave., St. Louis, Mo.
9 AKO A. Huston Barnett, 33 Kiwanis Apts., Ft. Wayne, Ind.
9 AKV James S. Cavallo 1633 W. Adams St., Chicago, Ill.
9 ATG Maynard R. Briggs, 251 N. Oxford Ave., St. Paul, Minn.
9 ATO Edwin A. Cary, 443 Bishop Ave...Milwaukee, Wisc.
9 BN Marcus Green, 918 Wilson Ave.....Chicago, Ill.
9 BIF Edwin F. Havens, 2018 York St..Des Moines, Iowa
9 BLF Harold R. Reiss, 542 W. Main St...Sparta, Wisc.
9 BWD Forrest D. Kettering, 1522 24th St., Rock Island, Ill.
9 BXP Walter K. Robinson, 948 W. Gale St., Williamsfield, Ill.
9 BZG Everett A. Ludley, R. F. D. No. 3, Box 74, Manchester, Iowa
9 CVD Joseph J. Bremken, 1110 32d St.....Omaha, Nebr.
9 CXH Leon and Roger Drolet, 265 Main St., Bourbonaise, Ill.
9 DW Robert W. Carter, 597 Ann St....Blue Island, Ill.
9 DCO Alfred D. Fowler, 115 S. 27th St....Lincoln, Nebr.
9 DHF Cletus E. Bellinger, 227 W. Main St., Galesburg, Ill.
9 DUI Theodore F. Anderson, 404 S. Eighth St., Aberdeen, S. D.
9 EJ Robert E. Compton, 412 Wabash Ave., Carthage, Ill.
9 ECZ Ernest Smith, 1510 Cleveland St., Kansas City, Kans.
9 EFY Harry Hoebell, 6846 Wentworth Ave....Chicago, Ill.
9 CLN Arthur E. Thompson, c/o Meces Club, 4th and Gallatin Sts. .....Marion, Ind.
9 DIU Ralph R. Miner, 26 S. Lincoln Ave., Fond-du-Lac, Wisc.
9 HT John G. O'Rourke, 3064 E. 32d St....Ohama, Nebr.
9 GL Charles Triteline, 1005 14th St...Maywood, Ill.
9 PE Harry R. and Orval T. Conley, 205 E. 7th St., Metropolis, Ill.
9 DIB Gordon Knox, 4021 Chestnut St...Kansas City, Mo.
9 AMB Donald L. Hathaway, 4026 E. 19th Ave., Denver, Colo.
9 CJG Franklin M. Henry, 12 E. Bijou St., Colorado Springs, Colo.
9 CMN Samuel J. Saegesser, 2510 "D" St., Granite City, Ill.
9 COW Joseph L. Turre, 916 Madison St.....Denver, Colo.
9 DML Henry H. Lucker, 5024 Irving Park Blvd., Chicago, Ill.
9 PZ Paul R. Smith, 1427 Emerson Ave., N., Minneapolis, Minn.
9 ARJ Wilbur S. Felt, 323 Blaine St., Wellington, Kans.
9 AEB Lawrence Hirshberg, 138 Summit Ave., St. Paul, Minn.
9 AJR John G. Schultz, 1541 Montana St.....Chicago, Ill.
9 AJX Dennett Barrett, 222 Michigan Ave., Sheboygan, Wisc.
9 ALY Robert D. Linx, 835 Hackett Ave., Milwaukee, Wisc.
9 ARS J. Weldon Paine, 6132 University Ave., Chicago, Ill.
9 AYV Arthur W. Thiele, 3659 Armitage Ave., Chicago, Ill.
9 BAP John A. Dawson, 135 Middaugh Ave., Downers Grove, Ill.
9 BJB Donald H. Cameron, 1510 Cleveland St., Kansas City, Kans.
9 DAK Stewart B. Ross, 1937 N. Lawndale Ave., Chicago, Ill.
9 DBK Leonard F. Albrecht, 696 18th St., Des Moines, Iowa
9 DKU Charles S. Voigt, 1217 N. Sixth St., Sheboygan, Wisc.
9 DLB Lee Donald Grant, Box 267.....Valley Park, Mo.
9 DLJ Fred and Harry Seltzer, 3346 Douglas Blvd., Chicago, Ill.
9 DLL Tony Breede, 422 6th St., S. W., Mason City, Iowa
9 DLM William H. Hinton, 1107 Central Ave., Kansas City, Kans.
9 DLZ George DuRocher, 539 Poplar St., Poplar Bluffs, Mo.
9 DQF Charles Meloun, 2742 S. Homan Ave., Chicago, Ill.
9 DQQ John O. Ephgrave, 5424 Drexel Ave....Chicago, Ill.
9 DQX George Mechling, 1005 Park St.....Lincoln, Nebr.
9 DQW Minard MacCarthy, 701 Eastgate Ave., St. Louis, Mo.
9 DSG Charles R. Young, Route No. 1.....Bement, Ill.
9 D8J Selby A. Clark.....Bement, Ill.
9 DSY Boy's Technical High School, 345 Virginia St., Milwaukee, Wisc.
9 DTD Walter P. Newton, care of Missouri Military Academy, Mexico, Mo.
9 DUF Harold Webb, 1013 Pear St.....Mt. Carmel, Ill.
9 DXW Charles E. McGinnis, 2123 Brooklyn Ave., Kansas City, Mo.
9 DZM Charles F. Gatons, 118 Caton Ave.....Joliet, Ill.
9 DZP LeRoy Stoltz, 336 W. Main St.....Belleville, Ill.
9 DZV Russell D. Lightly, R. F. D. No. 7, Madison, Wisc.
9 JO George Dammann, 725 Oakton St.....Evanston, Ill.
9 AAB Russell Jay Andrews, 321 Broadway....Denver, Colo.
9 AAG Marvin S. Olson.....Carver, Minn.
9 AAI Clarice L. Cahoon, 423 East 7th St., Mt. Carmel, Ill.
9 ABC George D. Walker, 554 Gilpin St.....Denver, Colo.
9 ABP Clifford E. Chase, 657 W. Fourth St., Spencer, Iowa
9 ABR Ralph R. McKerrihan, 3075 S. Broadway, Denver, Colo.
9 ABY Wilbert A. Lindwall, 4916 N. Lowell Ave., Chicago, Ill.
9 ACD William H. Flanagin, 14 19th Pl., Chicago Heights, Ill.
9 ACS James Helbering, 712 Lafayette Ave., Racine, Wisc.
9 ACY W. G. Cram, 647 51st St.....Milwaukee, Wisc.
9 AFZ Freemont D. Schunck, 4702 Beloit Rd., Russell Jay Allis, Wisc.
9 AKB Edwin Mikesell, 631 N. Sixth St., Fredonia, Kans.
9 AMP Henry Haraldson .....Aneta, N. D.
9 AYQ Harold M. Lowrie.....Osakis, Minn.
9 BBE Jacob G. Harden, Main St.....Greenwood, Ind.
9 BCG Veri K. Thomson, 750 Third Ave., Sioux Falls, S. D.
9 DLG Robert Thompson, 751 N. Division St., Appleton, Wisc.
9 DLH Hugh C. Wafler, 2454 D St.....Granite City, Ill.
9 HX Donald H. Harrell, 126 Sixth St....Logansport, Ind.
9 JW E. S. Leavenworth, 1207 State St., Milwaukee, Wisc.
9 OZ Lewis J. Pupich, 2312 Greenview Ave., Chicago, Ill.
9 RG Continental Radio & Mfg. Co.....Newton, Iowa
9 AAQ Henry Thielke, Jr. .....Ackley, Iowa
9 AKB Simon C. Steinberg, 5723 Waterman St., St. Louis, Mo.
9 ABT Oakley L. Preston, 1036 Erie St.....Hammond, Ind.
9 ACH Ralph R. Leach, 2733 E. Grand Ave., Des Moines, Iowa
9 ACK Edwin F. Turner, 111 W. 4th St., Jamestown, N. D.
9 ADO George Wood, Jr., 2357 Dean Ave., Des Moines, Iowa
9 ADX William H. McMaster, Jr., St. Charles Hotel, Pierre, S. D.
9 AEL John R. Schricker, 1011 E. High St., Davenport, Iowa
9 AEU Harry V. Somerville, 1839 Liberty St., Marinette, Wisc.
9 AEX Stanley O. Johnson.....Harlem, Ill.
9 AFI Harry R. Collier, 3824 Fairfield Ave., Fort Wayne, Ind.
9 AFJ William G. Morton, 2030 Maple Ave., Marinette, Wisc.
9 AFM Gordon L. Davy, 215 8th St., N. W., Minot, N. D.
9 AFQ J. Ebert Cravens.....Greenfield, Ill.
9 APR George G. Glade, 1340 C St.....Lincoln, Nebr.
9 AGH Jule Wells, 2419 Fall Ave.....St. Louis, Mo.
9 AGL Howard M. Crosby.....Dawson, Minn.
9 AGQ Rudolph S. Stork, 5515 W. Monroe St...Chicago, Ill.
9 AGP Edward Leanse, 1711 N. Aldrich Ave., Minneapolis, Minn.
9 AGY Robert E. Eberly, 2218 S. Cedar St., Sioux City, Iowa
9 AHM Guy Z. Parman.....King City, Mo.
9 AHW Fred L. Mayer, Jr., 402 E. Marion St., Mt. Pulaski, Ill.
9 AIB Joe E. Smay, 214 S. Russell St.....Ames, Iowa
9 AIC Norman B. Williams, 205 N. Vermilion St., Streator, Ill.
9 AIT Earl Bostelman, 1612-a Semple Ave..St. Louis, Mo.
9 AJJ Glen M. Querna, Main St.....Madison, Minn.
9 AJO Donald B. Warnock, 308 N. Kansas St., Edwardsville, Ill.
9 AKA Keith T. Borlin, 214 Church St...Carrollton, Ill.
9 AKR Robert G. Bullock, 618-20 Lincoln Ave...York, Nebr.
9 ALV William A. Markle, 3905 Boulevard Pl., Indianapolis, Ind.
9 AMC Arthur D. Altemiller, 502 Jefferson St., Charleston, Ill.
9 ANI William A. Doyle, Jr., 628 Market St., Emporia, Kans.
9 APO George D. Stitzell, 841 E. 7th St., Des Moines, Iowa
9 AQT Chester B. Franz, 5358-a Easton Ave., St. Louis, Mo.
9 ARH John D. Banning, 3203 Hoagland Ave., Ft. Wayne, Ind.
9 ASB Frank Murphy, 493 College Ave....Appleton, Wisc.
9 ASY James De Haan, 9429 St. Lawrence Ave., Chicago, Ill.
9 ATB Albert Pauts, Jr., 815 Muskego Ave., Milwaukee, Wisc.
9 AUV Helm C. Hussner, 968 Drew St.....Appleton, Wisc.
9 AVB Theodore Ekstrom, 100 E. 14th St., Minneapolis, Minn.
9 AYE Wilber L. Matthews, 1351 York St...Des Moines, Iowa
9 AYX Raymond L. Keller, 1315 N. Second St., Belleville, Ill.
9 AZT Irwin C. Stoll, 2259 Leland Ave.....Chicago, Ill.
9 AZU John D. Yelland, 3221 Holmes Ave., Minneapolis, Minn.
9 BEJ Roy Closs, Box 184.....Minneapolis, Minn.
9 BNC Robert F. Adams, Craig Pl.....St. Ignace, Mich.
9 CDW Gustav C. Rehm, 5205-a Gravois Ave...St. Louis, Mo.
9 DIT Forrest N. Turney.....Lombard, Ill.
9 DLO Frederick W. Richards, R. F. D. No. 6...Streator, Ill.
9 DLW Henry Mutschleckner, 1238 Fairfield Ave., Ft. Wayne, Ind.
9 JS Christian H. Schwingel, 412 W. Doty St., Madison, Wisc.
9 MU Monmouth College, E. Broadway.....Monmouth, Ill.
9 VX Menominee High School, Broadway and Stephenson Sts., Menominee, Mich.
9 AAK John H. Walter, 18 Lincoln Pl...Wauwatosa, Wisc.
9 AAT Frank Trudelle, 245 Oneida St., Milwaukee, Wisc.
9 AAZ Richard Hoving, 1630 Blue Island Ave., Chicago, Ill.
9 ABQ James C. Fear.....Augusta, Ga.
9 ACI R. A. Barnett, 6169 Waterman Ave., St. Louis, Mo.
9 ACM Alvis L. Ledrowski, 833 Ludington St., Columbus, Wisc.
9 ACO Henry H. Poetker, 4186 Concordia Ave., St. Louis, Mo.
9 ADB John J. Martin, 5656 W. Flousant St., St. Louis, Mo.
9 ADI Elmer M. Ward, 602 S. 38th St. ....Omaha, Nebr.
9 ADS John F. Reding, 201 W. George St., Chicago, Ill.
9 AEA Wilbur L. Pedersen, 3515 Portland Ave., Minneapolis, Minn.
9 AEF Phillips E. Lohr.....Churdan, Iowa
9 ART Arndt F. Erickson, Craig Pl. and Ash...Lombard, Ill.
9 AEM William E. Warning, Main and Dixie, Hammond, Ind.
9 AEP Kenneth Iverson .....Hills, Minn.
9 AEV Thomas E. Tynan, 915 Queen Ave., Minneapolis, Minn.
9 AFG Echeal T. Feinstein, 5335 Ridge Ave., St. Louis, Mo.
9 AFX Frederick W. Loeb, 5227 Dorchester Ave., Chicago, Ill.
9 AFY Arthur Luessenhop, 633 W. DeWald St., Ft. Wayne, Ind.
9 AHG Richard E. Davis, 113 E. 10th St., Concordia, Kans.
9 AHN Frank L. Kinch, Jr., 315 Cottage Grove Ave., Cedar Rapids, Iowa
9 AIV Alvin S. Peck, 2836 Burling St., Chicago, Ill.
9 AJI Esmond Avery, Westminister Church, Nicollet and 12th St., Minneapolis, Minn.
9 AJQ Douglas F. W. Coffey, 22-24 Carroll St., Madison, Wisc.
9 AKC Albert M. Reager, 116 Bellaire Ave...Louisville, Ky.
9 AKE George H. Newgirg, 408 S. Third St., Eagle Grove, Iowa
9 AKF Francis A. Fillmore, 4222 Nebraska Ave., St. Louis, Mo.
9 AKM William H. Gilchrist, 6223 Greenwood Ave., Chicago, Ill.
9 AKQ Melvin J. W. Binks, 1138 Lombard Ave., Oak Park, Ill.
9 ALQ Lester J. Wolf, Dixie Highway at Clark St., Homewood, Ill.
9 ANZ Louis F. Leuck.....Wakefield, Nebr.
9 AOA Herschel G. Thomas.....Auryane, Mo.
9 AOC Allen J. Strang, 255 Sheldon St., Richland Center, Wisc.
9 AOF Albert W. McGuffin, 823 Ninth St., Devils Lake, N. D.
9 AOH Frank O. Sharp, 1049 N. Alabama St., Indianapolis, Ind.
9 AOM Frank O. Dixon.....Knoxville, Iowa
9 AOX Murray G. Crosby.....Elroy, Wisc.
9 AOZ Rudolph E. Isenberg, 1503 Meirose St., Chicago, Ill.
9 AQI George C. Kephart, 3924 Peters Ave., Sioux City, Iowa
9 ASC Philip Carney .....Faribault, Minn.
9 ASR William W. Pennell, 3717-a Lincoln Ave., St. Louis, Mo.
9 DQH George Smith, 523 Third Ave., S. E., Minneapolis, Minn.
9 DST Vernon Wright, River St.....Manston, Wisc.
9 DTO S. D. Michael, R. R. No. 2.....Ossian, Ind.
9 DUT John W. Lichtenbarger, R. R. No. 1, Box 43, South Bend, Ind.
9 BA Harold Lehman, 5013 Dakin St.....Chicago, Ill.
9 BB Beverly Dudley, 4909 Fletcher St.....Chicago, Ill.
9 BS Lewis W. Seil, 2057 W. 21st St.....Chicago, Ill.
9 BU Edward J. Selenske, 3137 N. Hamlin Ave., Chicago, Ill.
9 AI Raymond J. Solomon, King and Lake Sts., Crystal Lake, Ill.
9 AW James R. Wiles, 298 N. Prairie Ave., Bradley, Ill.
9 AY Oscar A. Seim, White St.....Hickson, Minn.
9 AZ John R. Wilkinson, 839 S. Wildwood Ave., Kankakee, Ill.
9 AZ John R. Wilkinson, 839 S. Wildwood Ave., Kankakee, Ill.
9 BC Radio Mfg. Corp., 908 E. Lake St., Minneapolis, Minn.
9 BH Guy H. Brown, 110 N. Main St., Fairmont, Minn.
9 BV Mark H. Forbes, 525 Milwaukee Ave., Kenosha, Wisc.
9 CK Ray J. Palmer .....Cambridge, Iowa
9 CU Appleton High School .....Appleton, Wisc.
9 CY Joseph L. Rockett, Government and Thornton Ave., Wauwatosa, Wisc.
9 DF Edward Fruth, 6145 S. Paulina St., Chicago, Ill.
9 DM Harold L. Sheets, 825 S. Lawrence Ave., Jamestown, N. Dak.
9 DO H. Livingston .....West Plains, Mo.
9 DP Charles J. Sheblak, 537 36th St., Milwaukee, Wisc.
9 DR Joseph J. Maus, 3623 N. 9th St., St. Louis, Mo.
9 EB F. Archie Schultz .....Clarkson, Nebr.
9 ED Lawrence C. Hecht, 1744 Chicago Ave., Evanston, Ill.
9 EF Carlton Rave, 1525 Maple St.....Racine, Wisc.
9 EO B. Fred Pardieck, 1803 S. Elm St., Mason City, Iowa
9 EM James H. Slusser, 1214 Erie Ave., Logansport, Ind.
9 ER Byron Mowrey, 451, 9th St.....Lincoln, Ill.
9 ES Theo. Scully Cliff, 32 N. 14th St., Terre Haute, Ind.
9 FB Warren A. Hodges, 926 E. Mishawaka Ave., Mishawaka, Ind.
9 FE John R. Swinton, 229 Johnson Ave., Trinidad, Colo.
9 FG Lawrence D. Dillard, 4645 Delmar, St. Louis, Mo.
9 FN R. C. Lowe .....Fairmont, Minn.
9 FO Ralph Stegner, 166 S. Ramsey St., Redwood Falls, Minn.
9 FQ Jesse Cohen, 417 State St.....Madison, Wisc.
9 FR Frank R. Gerlich, 813 University Ave., N. W., Minneapolis, Minn.
9 FY Frank V. Watts, 416 Jackson Ave., West Plains, Mo.
9 GH Carlos E. Peters, 3539 Hartford St., St. Louis, Mo.
9 GN First Baptist Church .....Hudson, Wisc.
9 GP Robert D. Hauch, 835 Wenonah Ave., Oak Park, Ill.
9 GR Victor C. Mazylewski, 1610 N. Lawndale Ave., Chicago, Ill.
9 GS Harvey W. Miller, 655 Hi-Mount Blvd., Milwaukee, Wisc.
9 HA Irving B. Lusck, 614 First Ave. ..Antigo, Wisc.
9 HC Arthur A. Morse, Jr., 96 Virginia Ave., St. Paul, Minn.
9 HI George E. Borgman, 2434 Stevens Ave., Minneapolis, Minn.
9 HN M. D. Mealey, 520 S. Workman St. ..Lyons, Kans.
9 HS Gregory J. Dertinger .....Perham, Minn.
9 IB Walter R. Cook, 2721 Askew Ave., Kansas City, Mo.
9 IE Lynn A. Mutchler .....Aneta, N. Dak.

HE'S ONLY A BOY

But when he installs a set—

IT WORKS!

2 Volumes
Size 3⅛ x 5 inches
Flexible Leather Covers
Fully Illustrated
96 pages in each volume
Price 2 Vols. **$1.00**

WHY? Because, boylike, he's a human interrogation point. He wasn't satisfied to follow a diagram of connections. What's the condenser for? Why the tuning coil? He wanted to know the reason!

Are you a broadcast listener—one of the many bewildered ones who hear the radio programmes now clear, now fuzzy? Perfect tuning makes a big difference in the quality of music or speech. There's a wide gap between the results secured by the novice when compared with those secured by the radio fan who knows the function of each part and its relation to the other apparatus in a receiver.

AN INTRODUCTION TO RADIO (The Title Tells the Story)

ANSWERS YOUR QUESTIONS—Every novice in radio always asks the same questions: What is a radio wave? How is it made? How long does it take to get to me from the broadcasting station? Is there any difference between the dot and dash waves and the music waves? What is a condenser for? What is a variometer? What is the difference between a vario-coupler and a loose coupler? How are the ear phones made? What does the crystal detector do? How does a vacuum tube work? What is the grid leak for? Is there any danger that my antenna will be struck by lightning? How can I tune my set to get the loudest signals? What is the difference between radio frequency and audio frequency? What is a potentiometer for and how does it differ from a rheostat? And scores of other questions. All are answered in this book.

FOR THE BEGINNER—Make no mistake. This is an elementary book. All who can read English can understand it. Funny how hard it is for an expert to talk shop so everyone can understand—there are a number of good technical books, but this is the best book we have ever seen of the hardest kind to do well.

An introduction to Radio. That is just what it is. Mr. (Miss or Mrs.) Reader, we take great pleasure in introducing Radio. After a few hours you can meet the other members of the family and talk radio with them as you can't now.

If you were sailing for France you would study an elementary text book on the French language—here is your book for your trip to radio land, the most fascinating country ever discovered by modern science. Explore it knowingly, as thousands are now doing, with a receiving set and "An Introduction to Radio."

In Two Volumes—Handy Pocket Size—For the Whole Family

What's In Them?

VOLUME 1

- An Introduction to Radio
- Radio Telephony
- The Various Instruments Used in Radio Transmitting and Receiving Outfits

VOLUME 2

- Technical Terms Explained
- How to Set up Receiving Outfits
- Primer of the Vacuum Tube
- How to Set up Radio Transmitters
- International, Morse Code and Conventional Signals

"Great!" is what the first readers of this book said. Just what they had been looking for. Everything in plain language, all the facts you need to know. One thing leads right to another in this book, for it starts with the A, B, and C and goes on through to the end in the proper order. You understand everything because there's nothing left out, no illogical jumps from one subject to another.

Make "An Introduction to Radio" the foundation of your radio library, the basis of your real understanding of what radio is and how its wonders are done.

Examine these two volumes. Go to your dealer and ask for them. If he hasn't them, ask him to order a supply, or, if you wish, pin a dollar bill or a check to the coupon and we will send the books on approval. Look them over for five days. If you are not wholly—100 per cent.—satisfied, return them and we will refund your money. Send for these books today. Pin a dollar to the coupon →

WIRELESS PRESS, Inc., New York

A-7-23

ORDER BLANK

WIRELESS PRESS, INC., Date
326 Broadway, New York.

Here's my dollar. Send me AN INTRODUCTION TO RADIO. If I don't like the books I'll return them in 5 days and get my money back.

Name .....

Address .....

City .....

State .....

SPECIAL OFFER

For $3.00 we will send you these books and THE WIRELESS AGE for a year (outside U. S., $3.50). This saves you 50c. If you want to grasp this opportunity check one of the squares below.

☐ New Subscriber ☐ I am now an AGE Subscriber

THE FADA
ONE-SIXTY

$120.00

"IF WE DON'T GET 'EM ON THE LOUD SPEAKER WE DON'T COUNT 'EM"

The FADA "ONE SIXTY" neutrodyne circuit receiver will consistently bring in broadcasted programs from broadcasting stations one thousand to fifteen hundred miles distant, with good volume using a loud speaker. Log records for the evening of May 16th, 1923 and under the new broadcasting wave length regulations, listed thirteen stations received with loud speaker intensity. Selectivity between stations very good.

	STATION	DIAL 1	DIAL 2	DIAL 3
WDAP	Chicago, Ill.	0	27½	27½
WHN	New York, N. Y.	0	31	29½
WGY	Schenectady, N. Y.	10	35	33
WDAR	Philadelphia, Pa.	12	36	34
WOR	Newark, N. J.	20	40	40
WBZ	Springfield, Mass.	22	24½	23
WGM	Atlanta, Ga.	28	49	49
WJAZ	Chicago, Ill.	31	53	51
WJY	New York, N. Y.	35	55	55
WEAF	New York, N. Y.	45	64	64
WOO	Philadelphia, Pa.	49	71	69
WCX	Detroit, Mich.	54½	72½	74
KSD	St. Louis, Mo.	60	84	84

The wave length range of the FADA "ONE SIXTY" allows reception from broadcasting stations in every part of the country. Arrange to have your local radio merchant demonstrate the "ONE SIXTY" in your home.

Send for bulletin describing the "ONE SIXTY" receiver in detail.

F. A. D. ANDREA, INC.—1581-C JEROME AVE.—NEW YORK CITY

The FADA "ONE SIXTY"

— WITH THE NEUTRODYNE CIRCUIT —